Vol. II

TRANSCRIPT OF RECORD

(Pages 117 to 637)

Supreme Court of the United States

OCTOBER TERM, 1944

No. 189

THE CONNECTICUT LIGHT AND POWER COMPANY, PETITIONER,

vs.

FEDERAL POWER COMMISSION

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA

PETITION FOR CERTIORARI FILED JUNE 23, 1944.

CERTIORARI GRANTED OCTOBER 9, 1944.

APPENDIX TO BRIEF FOR PETITIONER.

VOLUME II, pages 117 to 637.

IN THE

UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA.

No. 8341.

THE CONNECTICUT LIGHT AND POWER COMPANY,
Petitioner,

v.

FEDERAL POWER COMMISSION,
Respondent.

ON PETITION TO REVIEW ORDER OF FEDERAL POWER COMMISSION ENTERED MAY 15, 1942.

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PROCEEDINGS

HARTFORD, CONN., July 7, 1941.

* * * * * * [299]

Mr. Branch: The following enter special appearances for the respondent for the sole purpose of asserting lack of jurisdiction in the Commission over the respondent or over the subject matter of the above cited order of January 7th, 1941,—

Mr. Lawrence A. Howard and Mr. Olcott D. Smith, of the firm of Day, Berry & Howard, 750 Main Street, Hartford, Conn.

Claude R. Branch and Thomas J. Davis, Jr., of the firm of Choate, Hall & Stewart, 30 State Street, Boston, Mass.

Mr. Wahrenbrock: For the Commission, Howard E. Wahrenbrock and Howell Purdue, Commission Counsel.

Trial Examiner: The appearances will be entered.

* * * * * * [300]

Trial Examiner: Does coun el base their desire to enter a special appearance upon any question of the service of papers in connection with this hearing?

Mr. Branch: No, sir.

Trial Examiner: I understand your objection then is based on the general grounds of the jurisdiction of the Commission over your Company as a Public Utility; is that the reason for your special appearance?

Mr. Branch: Yes, sir; and over the subject matter of this litigation. No question is made as to the propriety of the service of papers. We had notice and know all about it.

* * * * * * [307]

Mr. Branch: May it please your Honor, we are ready. I think we discussed with you at our conference in Washington the order of procedure, and I am not complaining, that we haven't understood your position or the position of the Commission. Our position is that Counsel for the Commission should have the burden of proof and should proceed. My recollection is that

that matter was taken up with you, and you indicated that your ruling would be against us on that.

[*308*] Trial Examiner: That is correct. The burden is on the respondent to proceed.

Mr. Branch: May I have an exception noted to that?

Trial Examiner: You may.

* * * * * *

Mr. Branch: The contention of the respondent is that it is not a public utility within the mention of Parts 2 and 3 of the act, and it seems to us that that is the main issue in the proceeding before you. The reasons for that I will not go into. I think it is hardly useful at this time to argue the case. When and if we are forced to proceed, as I understand we are, we shall give merely a brief description, or [*309*] rather negative certain things that we feel are sufficient to show we are not subject to the jurisdiction of the Commission as such a public utility. The order to show cause alleges various failures on the part of the respondent to comply with orders and requests of the Commission. We have in our answer specifically made answer to those various allegations, giving our reasons for our failure to do so in cases where we have failed, and for the most part there is no dispute in regard to the fact that we have not done the major things that are requested, the things being matters which we contend can be required only of public utilities as defined in the parts of the Act to which I have referred. There are a number of other matters which conceivably counsel for the Commission might contend might be required, even of companies which were not public utilities. These matters seem to us to be trivial. They relate to such matters as failure to have an officer of the Company execute a supplemental oath, or something of that kind. Our answer also offers, in order to simplify the issue and save time, to do most of those things, and we hope that our statement that we are now willing to conform with those formalities in those instances will obviate the necessity for further inquiry into those matters, and that we will be able to confine ourselves to the real issue in this

case, that is, whether the respondent is a public utility within the meaning of the Act.

* * * * * * [*318*]

C. L. CAMPBELL

a witness called on behalf of Respondent, being first duly sworn, testified as follows:

Direct Examination by Mr. BRANCH.

Mr. Branch: May I ask whether it is customary in hearings before you, that counsel stand while examining witnesses or not?

Trial Examiner: It is not necessary that counsel stand while examining a witness, but they should rise in all cases in argument.

[*319*] Mr. Branch: Would it be just as agreeable to you if we sit, as to stand?

Trial Examiner: In questioning the witness, yes.

By Mr. Branch: *Q* Please state your name. *A* My name is C. L. Campbell.

Q Are you president of The Connecticut Light and Power Company? *A* I am.

Q How long have you held that position? *A* Since 1937.

Q Were you an officer of that company prior to that time? *A* Yes.

Q What position did you hold beginning with the year 1935? *A* I was vice-president in 1935 until I became president in 1937.

Q Will you describe in a general way the business of your company as it has been since August, 1935? *A*. The business of the company consists principally of the production, purchase, transmission, distribution and sale of electricity and gas for residential, commercial, industrial and municipal purposes in the State of Connecticut. The territory served by the company with electricity or gas or both covers approximately 3235 square miles, with a [*320*] population of about 703,000 based on the 1940 Federal Census, not including the territory served by other Connecticut utilities, purchasing substantially all of their requirements from the company. Electric service is supplied by the company in 107

towns, cities or boroughs of Connecticut, with a total population of about 660,000 based on the 1940 census, not including about 130,000 served by other Connecticut public utilities purchasing substantially all of their electric requirements from the company. The territory served directly by the company covers a substantial part of the State of Connecticut, including the cities of Bristol, Meridan, New Britain, Norwalk, Waterbury, Willimantic, Winsted, Putnam, Rockville, and the town of Greenwich. Electric energy is supplied at wholesale to other public utilities.

Q Are you familiar with the extent of the property and the scope of the business of your company? *A* Yes.

Q Does your company own any property or operate any property outside of the State of Connecticut? *A* No.

Q At any time since August 26, 1935, has it owned or operated any property outside of the State of Connecticut? *A* No.

[*321*] *Q* Has your company since August 26, 1935, bought or sold any electric energy outside of the State of Connecticut? *A* No.

Q Has your company at any time since August 26, 1935, owned or operated any interstate transmission line? A No.

Mr. Wahrenbrock: Mr. Examiner, I object to that last question. The examination is proceeding so rapidly, that I am afraid I did not get on my feet in time—

Mr. Branch: (Interrupting) I certainly do not want to take any advantage of that.

Mr. Wahrenbrock: It obviously calls for a legal conclusion that I believe the witness has not been qualified to express an opinion on.

Mr. Branch: It seems to me that that is a proper question, whether it has any interstate transmission line.

Trial Examiner: How was that question worded? As to the ownership of an interstate transmission line?

Mr. Branch: Ownership or operation of an interstate transmission line.

Trial Examiner: Does counsel mean by that a line—the owner-

ship of the line which crosses the State line? Is that what you mean?

Mr. Branch: Yes, sir.

Trial Examiner: I think if you will word your question [*322*] that way that it will avoid the conclusion that it suggested. An interstate transmission line may have two connotations. As I understood it, you meant a transmission line which crossed the State line?

Mr. Branch: Yes, sir. I will word it that way.

By Mr. Branch: *Q* Mr. Campbell, with that explanation, will you answer the question. *A* No.

Mr. Wahrenbrock: Now, Mr. Examiner, may I have the same ruling with respect to the preceding question which involved the question of the purchase or sale of electric energy outside of the State? That involves a question, both as to the legal question as to where the sale is, and involves the same electrical questions as to where the service which is being bought or sold is, neither of which the witness has been qualified to answer. I would like then to object to the asking of that question and ask that the answer already given be stricken.

Trial Examiner: Have you made a motion to strike?

Mr. Wahrenbrock. Please.

Mr. Branch: It seems to me that the question is perfectly clear and proper and is not subject to the objections which have been stated, whether they bought or sold any electric energy outside of the State of Connecticut.

[*323*] Trial Examiner: In other words, I understood the question to mean, and I think you meant the question in the sense of whether any sales were made outside of the State, that is, whether any contracts were made outside of the State,—is that the idea?

Mr. Branch: Contracts with parties outside of the State, yes.

Trial Examiner: In view of that statement, do you still have the same objection?

Mr. Wahrenbrock: If the question and the answer thereto may

be stricken and that question put, I have no objection to its being answered.

Mr. Branch: I am sorry, I did not hear that. I was interrupted.

Trial Examiner: Counsel for the Commission made the statement that if the original question were withdrawn and the question asked in the manner which you have last stated—contracts with parties outside of the State, that he would have no objection to the question in that form.

Mr. Branch: Very well, I will ask that question of Mr. Campbell.

Mr. Wahrenbrock: And may the answer to the preceding question be stricken?

Trial Examiner: I will so direct.

The Witness: The answer is, no.

[324] By Mr. Branch: *Q* And in that connection, Mr. Campbell, did your company at any time since August 26, 1935, make any contracts to deliver electricity or to receive electricity outside of the State of Connecticut? *A* No.

Mr. Wahrenbrock: Mr. Examiner, before that answer is received, may I have the same objection and have it specified what "outside of the State" in the language it refers to?

Trial Examiner: I think the question might be clarified to that extent.

By Mr. Branch: *Q* Did your company, Mr. Campbell, at any time since August 26, 1935, sell any electricity to anyone to be delivered outside of the State of Connecticut?

Mr. Wahrenbrock: Just a moment, please. I am going to have to object to that question, Mr. Examiner—the "to be delivered".

Trial Examiner: Do you make that to be delivered to the immediate purchaser outside of the State?

Mr. Branch: Yes, sir.

Mr. Wahrenbrock: By the terms of the contract? If that is the meaning of the question, I have no objection.

Mr. Branch: Yes, that is my meaning.

The Witness: The answer is, no.

[325] By Mr. Branch: *Q* Did your company enter into any arrangement or contract by which it was to receive outside of the State any electricity?

Mr. Wahrenbrock: May I object to that question unless it is specified—

Trial Examiner: (Interrupting) I think that the question, in view of the wording—counsel used the expression "received outside of the State" any electricity, and I think in view of that question, that your objection will not stand to that question. I will overrule your objection to that question.

Mr. Wahrenbrock: On that point, I believe the witness would have to be qualified to state where the service which is being received is located, and in the case of electric energy which is generated in one State and consumed in another State, which might be questions of a technical nature, which he has thus far not been qualified to answer. And if the question is modified to make it "according to the terms of the contract", I have no objection to it.

Mr. Branch: I think that that question is proper, and I object to the motion to strike.

Trial Examiner: Will you re-state the question? I would like to have the question restated. Will you read it, Mr. Reporter?

(Whereupon the last question as above recorded, was read [326] by the reporter.)

Trial Examiner: The question is permissible. He may answer.

The Witness: The answer is, no.

By Mr. Branch: *Q* At any time since August 26, 1935, has your company owned any line connecting at the Connecticut State line with the line of any other utility? *A* No.

Q At any time since August 23, 1935, has any electric energy crossed the State line under the ownership or control of your company?

Mr. Wahrenbrock: Mr. Examiner, I must object to that question. The question of electric energy crossing the State line and under whose control it is, is one that calls for technical qualifica-

tions which have thus far not been shown with respect to this witness.

Trial Examiner: The objection is sustained so far as there is any qualification yet shown of this witness.

By Mr. Branch: *Q* I will ask the question whether at any time since August 26, 1935, any electric energy has crossed the State line under the ownership of your company?

Mr. Wahrenbrock: The same objection, for the same reasons.

Trial Examiner: Same ruling.

[*327*] Mr. Branch: Will your Honor note my exception?

Trial Examiner: Yes.

Mr. Branch: Also I understand that you sustained an objection to the previous question?

Trial Examiner: Yes.

Mr. Branch: I thought I had split it up into two questions, but I will now ask the question for the purpose of the record, you understand.

By Mr. Branch: *Q* At any time since August 26, 1935, has any electric energy crossed the State line under the control of your company?

Mr. Wahrenbrock: To that question I object for the reasons stated.

Trial Examiner: Objection sustained.

Mr. Branch: And may my exception be noted?

Trial Examiner: Yes.

By Mr. Branch: *Q* At any time since August 26, 1935, has your company sold any electric energy to any company or other utilities outside of Connecticut? *A* No.

Q At any time since August 26, 1935, has your company delivered any electric energy to any company or other utility at the State line?

Mr. Wahrenbrock: To that question I object as calling [*328*] for a statement as to the point of delivery of electric energy which requires a technical showing by a man technically qualified to

establish the point of delivery of electric energy, the qualifications not yet having been given with respect to this witness.

Mr. Branch: I do not think it calls for that. It calls for the arrangements which were made and what was done.

Mr. Wahrenbrock: If counsel wishes to phrase his question so that it will refer to what the contracts provide, or with respect to contract provisions, I will not make that objection.

Trial Examiner: Will you reword your question to make it a matter of contract provision?

Mr. Branch: I can do that very easily, sir, but I wish to press the question that I have asked and would like a ruling on it.

Trial Examiner: I will rule that the question is not in order as far as the present qualification shown by the witness as to the point of delivery. The contract provisions may be shown by this witness, however.

Mr. Branch: May I have an exception noted?

Trial Examiner: You may.

Mr. Branch: I will avail myself of the ruling—

Trial Examiner: (Interrupting) I may say in that connection that an exception should be noted automatically by the reporter in every case where an objection is overruled or where [*329*] an objection to a question is sustained.

Mr. Branch: Then I understand that it will be unnecessary for me to go through the rather unpleasant routine of taking an exception on the record after each unfavorable ruling?

Trial Examiner: That need not be done. The exception will be noted by the reporter.

Mr. Branch: I trust that your Honor will pardon me occasionally for making the statement that I take an exception, through force of habit.

Trial Examiner: That is natural.

By Mr. Branch: *Q* At any time since August 26, 1935, has your company had any contract or arrangements calling for delivery of electric energy to any company or other utility at the State line? *A* No.

Q Did any registered holding company own a majority of the voting stock of your company? *A* Yes.

Q Will you please explain—

Mr. Wahrenbrock: Mr. Examiner,—excuse me, I withdraw my objection.

The Witness: The United Gas Improvement Company owned —may I have the question again? I am a little bit confused as [330] to its wording.

By Mr. Branch: *Q* I think you have just said that your company did—or that a registered holding company did own a majority of the voting stock of your company. I am now asking you if you will explain that.

Trial Examiner: I do not believe he answered that question yet. I think he was interrupted.

The Witness: I was over in midstream with the question.

Mr. Wahrenbrock: To that question I interpose an objection that it is irrelevant to this proceeding.

Mr. Branch: I think we will take more time arguing that than we will to answer the two very short questions I have in regard to it.

Trial Examiner: I think we will admit it for what it may be worth.

Mr. Wahrenbrock: May I be heard, Mr. Examiner?

Trial Examiner: Yes.

Mr. Wahrenbrock: The only purpose that I can anticipate, and I am making an argument now without knowing what argument is made in support of the question, the only purpose I can anticipate is to show that the respondent was subject to the requirements of the Public Utility Holding Act of 1935, and I anticipate that the only relevancy that might be assumed that it would have is with reference to the amortization of the [331] unamortized debt, discount and expense on the security issue made by the respondent since August 26, 1935.

The Commission will judicially notice the Public Utility Holding Company Act, and will notice that there is no provision applic-

able to this company requiring or affording any means by which the Securities and Exchange Commission is authorized to pass upon that plan of amortization or any plan of amortization and that being the case, any proof that this company is subject to the Public Utility Holding Company Act is irrelevant.

Mr. Smith: Mr. Examiner, may I state this point?

Trial Examiner: Yes.

Mr. Smith: Mr. Wahrenbrock is correct. He has anticipated the reason for these questions. The relevancy I think is obvious, because we have a stipulation which will later be presented to your Honor, which Mr. Wahrenbrock has advised me he has signed, which stipulation covers two paragraphs put in at the request of Mr. Wahrenbrock or myself—I don't remember which—concerning this very matter of the applicability to this company of a provision of the Public Utility Holding Act of 1935. There is a provision in the Federal Power Act, Section 318 which provides, we claim, that if a company is subject to the regulatory authority under the Public Utility Holding Company Act, then it is not subject to the regulatory authority under [*332*] the Federal Power Act. That is a question of construction. To lay the basis for that claim, we wish to show that we were subject to the Public Utility Holding Company Act of 1935, because we were a subsidiary of a registered holding company.

Trial Examiner: Is there anything further?

Mr. Wahrenbrock: Mr. Examiner, in response to that, I may say that Paragraph 3 of the stipulation which we will offer is included in the draft of the stipulation which I have signed and which the respondent's counsel has signed, and when that stipulation is offered, I shall object to the inclusion of that paragraph pursuant to the provision of the stipulation permitting me to make such objection, as being irrelevant and immaterial. If as a matter of fact and law, the respondent though a subsidiary of a registered holding company was not subject to any requirement, regulation or order of the Securities and Exchange Commission with respect to its plan of amortization of this debt discount and

expense, then it is not by the provisions of Section 318 exempt from the requirements of the regulations prescribed by the Federal Power Commission, so that the proffered evidence is irrelevant.

Trial Examiner: I doubt the relevancy and materiality of the evidence on this point. It may enter, however, into the question of motive.

Mr. Wahrenbrock: I beg your pardon?

[*333*] Trial Examiner: And the general attitude toward regulation by the Federal Government, and for that reason I will permit the witness to answer the question.

Mr. Wahrenbrock: May I specify this additional point, which is aside from the main point of my argument, and that is, that the matter is stipulated, and if admissible will be found in the stipulation, and anything now would be, which it need not be, the subject of cumulative evidence.

Trial Examiner: The ruling of the Trial Examiner is that the question may be answered.

By Mr. Branch: *Q* Mr. Campbell, have you the question in mind now? *A* Yes.

Q I just asked you whether any registered holding company did own a majority of the voting stock of your company? *A*. Yes.

Q I understand that a registered holding company did own a majority of the stock. *A* Yes.

Q Will you explain that situation. *A* The United Gas Improvement Company owned 701,253 shares until April, 1941. It owned these shares for many years, some prior to August 26, 1935. This constituted about 61 per cent of all of the common stock, which had been the only stock of the company which has had voting power.

[*334*] Mr. Wahrenbrock: I move that that answer and the question be stricken for the reasons I stated.

Trial Examiner: The motion is overruled.

Mr. Wahrenbrock: Exception.

By Mr. Branch: *Q* Has the United Gas Improvement Company sold all of its stock in your company? *A* Yes.

Mr. Wahrenbrock: I object to that for the same reason.

Trial Examiner: You may answer the question, if you know.

The Witness: Yes, it sold it in April, 1941.

By Mr. Branch: *Q* Were you aware in 1935, of the fact that legislation was pending in Congress which resulted in the passage of what is now Part 2 of the Federal Power Act? *A* Yes, I kept in touch with the progress of that legislation.

Q Prior to the enactment of that legislation, did you endeavor to arrange the conduct of the business of your company so that it would not be subject to the provisions of Part 2 of that Act? *A* Yes, I did.

Q Have you at all times since August 26, 1935, been of the opinion that your company was not a public utility, as that term is defined in Part 2 of the Federal Power Act? [*335*] *A* Yes.

Q Since you have been president, have you been the officer of your company who has formulated its policies in regard to its dealings with the Federal Power Commission? *A* Yes.

Q In those cases in which your company has not complied with orders of the Commission, what was the reason for non-compliance? *A* In general, the reason was that I believed that the requests were properly applicable only to public utilities, as that term is defined in Part 2 of the Federal Power Act, and I believe that the company was not such a public utility. We did, however, from time to time, furnish the Power Commission with information which it requested. In some cases it seemed doubtful whether the Power Commission was requesting information of us as a public utility within the meaning of Part 2 of the Federal Power Act, or whether it was endeavoring to secure information as provided in Section 311 of the Act. I believed it was doubtful if the Commission has the right to require us to prepare special data under the provisions of Section 311, and felt that all we could properly be required to do would be to furnish such information as we had. We consequently did furnish information

which we had in the form in which we had it, or told the Federal Power Commission where it could get such information.

* * * * * * * [378]

By Mr. Branch: *Q* Have you the answer now? *A* Yes.

Q I direct your attention to paragraph 12 on pages 5 and 6 in which it is alleged the company has filed with the Federal Power Commission, on certified Power Commission forms, various rate schedules, contracts, and statistics as to the production of energy, and I ask whether or not the files of your company indicate that such forms were filed with the Federal Power Commission? *A* Yes, they do.

Q There is, however, mention of certain specific things that you have filed, but there is one place at least where it [379] says your company has filed each additional contract between the company and every other utility. Was that a mistake, Mr. Campbell? *A* Yes. An investigation made under my direction shows that all of the things referred to in paragraph 12 of the answer were filed except our additional contracts with other utilities.

* * * * * * [387]

Cross Examination by Mr. WAHRENBROCK.

* * * * * * [405]

Q Referring to paragraph 12 of the respondent's answer to the order to show cause, and to the sub-paragraph of that item which begins, "In January, 1935, all of the then existing contracts of the company— *A* Just a moment.

Trial Examiner: That is the second paragraph on page 6 of the answer.

The Witness: Yes.

Q (Continuing) "All the then existing contracts of the company with other utilities on Federal Power Commission form No. 2." Were those contracts submitted in response to a request from the National Power Survey, which was being conducted by the Commission at that time, or the National Rate Survey? *A* I was just trying to think. I am not sure, but I think it was filed in connection with some regular form that the Commission had sent

out generally through the country as a whole, to the utility business, asking for this information. Whether it was in connection with the filing of an annual report, or whether it was a special question, and just what it had to do with, I don't know.

Q Those contracts were submitted in January, 1935, before the Federal Power Act had been enacted? *A* Yes.

Q Now, I believe you stated that the subsequent state- [*406*] ment which appears in the answer is incorrect. That statement reads, "Since that date it has filed each additional contract between the company and any other utility." *A* I don't understand that question.

Q Is that statement in the answer incorrect, which reads, "Since that date it has filed each additional contract between the company and any other utility"?

Trial Examiner: That is the remainder of that paragraph following right on there, the second paragraph, page 6.

The Witness: Yes, that is incorrect.

By Mr. Wahrenbrock: *Q* Now, will you tell me what contracts there has been between the company and other utilities for the sale of electric energy for resale since January, 1935? *A* I couldn't enumerate them. There may have been none, there may have been quite a number.

* * * * * * [*408*]

Q Have you made any contract or any modification of a contract with the Borough of Groton since 1935? *A* Yes.

Q Do you remember when that was? *A* I would say it was within a year.

Q That is the only change or modification in the contract with the Borough of Groton since the beginning of 1935? *A* I wouldn't want to say that. I don't know.

Q You think there may have been another one? *A* It is quite possible there may have been, but there may not have been. I don't know.

Q Did you have any contract covering the delivery or receipt of energy at wholesale at New Britain with The Connecticut Power Company? *A* No.

Q You have had at no time since the beginning of 1935? *A* No.

Q When you received energy at New Britain up to some time in August, 1935, under what arrangement was it received? *A* I don't know that I quite understand what you mean by arrangement.

Q You heard the question all right? [*409*] *A* Yes, but I don't understand what you mean by arrangement. Do you mean physical arrangement?

Q I mean under what contractural arrangement or agreement? *A* There was no agreement. The power and equipment was supplied from our main system, consisting of two steam plants, one at Montville, one at Devon, and several hydro-electric plants scattered throughout the State, tied together in a State-wide transmission system.

* * * * * * [*410*]

By Mr. Wahrenbrock: *Q* What contract was in effect covering those receipts and deliveries of electric energy between your company and the Connecticut Power Company at New Britain? *A* By New Britain do you mean the City of New Britain, or at a point near New Britain?

Q You did receive electric energy, delivery of electric energy from and to the Connecticut Power Company after January 1, 1935? *A* I expect we did.

Q And was that under an agreement or a contract with the Connecticut Power Company? *A* I am not sure it was with the Connecticut Power Company.

[*411*] *Q* With whom was it? *A* It may have been with the Connecticut Power Company, but it may have been that it was through—It was through a combination, as I recall it, of the Hartford Electric Light Company and the Connecticut Power Company, under which those systems were interconnected at a point—interconnected with our system at a point near New Britain, and power was interchanged with those companies. The contract was not a—well, I suppose it was a contract—it was an orally

expressed arrangement, mostly, which could be terminated at notice.

Q Did you file any copy of that contract with the Federal Power Commission at any time? *A* I don't expect so, no.

* * * * * * [*412*]

By Mr. Wahrenbrock: *Q* At any time since January 1, 1935, has the Connecticut Light and Power Company received electric energy from the Connecticut Power Company for its Bristol system? *A* Yes.

Q Is that received under and in accordance with the terms of a contract between them? *A* It is.

Q When was that contract made? *A* The original contract was made a very long time ago, before the Connecticut Light and Power Company had anything to do with the Bristol situation. The contract has been modified at least once, perhaps more than that, since we took over the Bristol Company, which was in 1926 or 1927, somewhere then. Just when the last revision was made, I am not able to tell you from my recollection.

Q Would it refresh your recollection for me to suggest there was a contract dated November 1, 1930? *A* Well, if that is—if there is a contract with that date, that must be it. If you show me the contract, I—

Q I show you a copy of the six-page document bearing in the upper right-hand corner of the first page the notation, "The Connecticut Power Company, rate schedule, FPC No. 4, effective date November 9, 1937, filing date November 9, 1937", [*413*] and ask you if you recognize that? *A* Yes, I would expect that that is the present effective contract between the two companies. It is the effective contract covering the supply of power.

* * * * * * [*414*]

Mr. Wahrenbrock: I hand the reporter and counsel for the other side copies of the contracts to which I have last referred and ask that the reporter mark it for identification as Exhibit 8.

Trial Examiner: They will be so marked.

(The document referred to is marked Exhibit Number 8 for Identification.)

[*415*] By Mr. Wahrenbrock: *Q* Is the contract of which Exhibit 8 for Identification purports to be a copy, filed with the Federal Power Commission with the stamp of the Federal Power Commission as the identification in the upper right-hand corner to which I have referred, a contract which is now in force and effect? *A* Yes, I understand that those two notations there are excluded as a part of the contract?

Q Yes. *A* Yes, it is.

Q Has it been modified at any time? *A* I think not, no, not as far as I recall.

Q No copy of this contract was ever filed by the Connecticut Light and Power Company with the Federal Power Commission? *A* I don't know.

[*416*] *Q* You have no recollection that any copy of this ever was filed? *A* No.

Q Was the contract therein referred to in the second paragraph as an agreement dated as of November 1, 1930, ever filed with the Commission? *A* I don't think so.

Trial Examiner: I think you had better make your question "filed by" some person, since there is evidence that it was filed by somebody.

By Mr. Wahrenbrock: *Q* I intended, and I think you understood my last question to mean "by the Connecticut Light and Power Company"? *A* I so assumed.

Trial Examiner: I thought both of you gentlemen assumed that but the record did not so show.

Mr. Wahrenbrock: Thank you very much, Mr. Examiner.

Now I hand counsel for the respondent and the Examiner and the Reporter a one-page document for identification as Exhibit 9.

Trial Examiner: It will be marked Exhibit 9 for Identification.

(The document referred to was marked Exhibit No. 9 for Identification.)

By Mr. Wahrenbrock: [*417*] *Q* I show the witness Exhibit 9 for Identification and ask him whether that indicates that the contract, of which Exhibit 8 is a copy, was modified. *A* I should say Yes.

Q Do you recognize that exhibit number 9, Mr. Campbell? *A* What do you mean by "recognize it"?

Q Are you familiar with the original, of which that is a copy? Do you recognize that? *A* No, I do not.

Q Do you have any knowledge of the letter of which that purports to be a copy? *A* Only the copy.

Q In the light of the statements made in that copy, have you now any recollection of whether the agreement of which Exhibit 8 is a copy was, as a matter of fact, modified? *A* I should say it had been.

Q Do you have any recollection of that independent of Exhibit 9? *A* No.

Mr. Wahrenbrock: I hand respondent's counsel and the reporter and the Examiner a one-page document which I ask to have identified as Exhibit 10.

Trial Examiner: It will be so marked.

Mr. Branch: 10 for Identification?

[*418*] Trial Examiner: 10 for Identification.

(The document referred to was marked Exhibit Number 10 for Identification.)

By Mr. Wahrenbrock. *Q* Mr. Examiner, I hand the reporter's copy of Exhibit 10 to the witness, and I ask you, Mr. Campbell, if you have any recollection of the transaction referred to in that exhibit? *A* No. That appears to be an acceptance of the previous letter, the other exhibit.

Q Does that refresh your recollection with respect to the modification of the contract of which Exhibit 8 is a copy? *A* Not very vividly. I recall now that I read that correspondence that there were certain discussions with the Connecticut Power Company, and in which I did not take part, which evidently led to this

adjustment or modification of that contract which you have previously referred to.

Q Was that modification or any copy of it filed by the Connecticut Light and Power Company with the Federal Power Commission? *A* I don't think so. If it was, they have a copy of it.

Q You do not recall that it was filed? *A* No.

[*419*] *Q* I am not sure whether I asked you whether the agreement of November 1st, 1930 referred to in Exhibit 8 was ever filed by the Connecticut Light and Power Company with the Federal Power Commission? *A* I don't know whether you asked me or not. The answer is that I don't know.

Q You have no recollection that it was? *A* I have no recollection.

Q Since January 1, 1935, has the Connecticut Light and Power Company delivered electricity to the Torrington Electric Light Company? *A* I don't know that I can answer that question. I don't know that it is capable of being answered.

Q Why not? *A* It is rather a complicated matter. We are buying power, or were for much of that period in question from the Torrington Company, and we have a small hydro-electric plant at Robertsville which feeds into that system, and I would suppose that none of that power went into Torrington, but it may have.

Q You have a contract with the Torrington Electric Light Company, covering at least the purchase of electric energy from that company? *A* Yes, sir.

Q When was that contract entered into? [*420*] *A* I cannot tell you when it was entered into. I don't recall the date, but if you have a copy of the contract, it ought not to be difficult to determine it.

Q I do not have a copy of the contract.

Mr. Wahrenbrock: I would like to call upon the respondent if it will please make available for inspection a copy of that contract.

The Witness: I beg your pardon; I find a reference here to the date. I have some notes here that I did not see. • It was dated August 11th, 1930.

By Mr. Wahrenbrock: *Q* August 11th, 1930? *A* Yes.

Q And is that contract on that date still in full force and effect? *A* No.

Q Has it been modified? *A* It is terminated.

Q It has been terminated? *A* By mutual agreement.

Q When was it terminated? *A* Oh, two or three months ago.

Q Was a new agreement entered into? *A* Let me modify my last answer; I am not quite correct. That contract in question was first modified by a letter dated [*421*] December 31, 1932. That modification dealt solely with some of the terms of the contract. We have owned for a number of years a right-of-way upon which we could build a line to connect with the line running from Winsted, so that the supply to Winsted, which is where the power for Torrington is purchased for the use of, could be supplied from our own system, and we have considered many times building that line and taking over the supply. Early this year, a study indicated that we could save some money by doing so, and we agreed with the Torrington Electric Light Company that upon the completion of the facilities, the other facilities, the present contract would be terminated, notwithstanding the fact that its terms calls for several years to run.

Q What is the date of that agreement? *A* That oral agreement?

Q Whatever form it was in. *A* I cannot tell you exactly. It was within the last two or three months.

Q And it was an oral agreement? *A* Yes.

Q There is nothing in writing about it? *A* Yes. I think after the conversation it was confirmed by a letter.

Q What was the date of the confirmation letter? [*422*] *A* Well, two or three days after the conversation.

Q Aside from the modification of December 31, 1932, and the agreement for the future termination of the contract, were there any other modifications or changes of the 1930 contract with the Torrington Electric Light Company? *A* There was no change in the contract.

Q No change in the contract? *A* Yes.

Q What other change was there? *A* Well, there was a change in the situation with respect to the source of the power that would be supplied by Torrington to the Electric Light and Power Company. That arrangement was consummated, I should say, about the middle of June or the early part of June.

Q Of what year? *A* 1941.

Q Was that an oral change? *A* Yes.

Q What was that change? *A* That change was that our line would be running carrying a supply of power to Winsted, and would be disconnected from the facilities to which it had formerly been connected in Torrington and be connected directly to a steam generating plant of the Torrington Electric Light Company, and the supply of power would be furnished from that steam plant.

[*423*] *Q* Was there any change in the price to be paid for the energy? *A* No—I would like perhaps to clarify that answer a little bit, because I do not want to mislead you. There was no change in the price for the energy, but the understanding and the arrangement with the Torrington Company was that we would pay them the same price for the energy as had formerly been paid under the old contract, but that we would in addition thereto pay them for their out-of-pocket expense in operating the steam plant, less the amount that they would have been called upon to pay the Connecticut Power Company, from whom they obtained their supply of power, if they had not generated the power for us at Torrington.

Q Was that agreement confirmed? *A*. No, I don't know that it was.

Q It was wholly oral? *A* Yes. There may have been some letter passed on it.

Q Did you write any letter on it? *A* I did. I wrote a letter as to the price.

Q When was the letter written? *A* Oh, a week or ten days after the arrangement was consummated—within a week.

Q Still in June of 1941? *A* Yes, sir.

Q Who handled the negotiations for that on behalf of [*424*] the Connecticut Light & Power Company? *A* I did.

Q In the discussions with the Torrington Company, did anybody participate with you in those discussions? *A* On behalf of us?

Q Yes? *A* No.

Q Who spoke on behalf of the Torrington Company? *A* Mr. Frank M. Travis. He is the president of the Torrington Electric Light Company.

[*425*] *Q* Was the— *A* May I add to that, after the discussion, there were then some engineering details to work out, perfect. Mr. Travis called in his engineers, his operating people, and explained what he had agreed to do with me, and I sent for our operating people. They worked out the details of the physical arrangements to carry out this plan.

Q Now, was the contract of 1930 with the Torrington Electric Company ever filed with the Federal Power Commission by the Connecticut Light and Power Company? *A* I can't answer that question. I don't know.

Q So far as your knowledge goes, it never was? *A* So far as my recollection goes, it never was.

Q You have no recollection of its having been filed with the Federal Power Commission? *A* No.

Q Was the December 31, 1932 modification ever filed with the Federal Power Commission? *A* Not as I recall.

Q Was the change, made as you say, in early June of 1941, for the termination of the contract—was the letter of confirmation with respect to that agreement ever filed with the Federal Power Commission? *A* No.

Q Was your letter with respect to the payment to be made [*426*] by the Connecticut Light and Power Company, the change in the payment to be made, ever filed with the Federal Power Commission? *A* No.

* * * * * * [454]

Cross Examination by Mr. WAHRENBROCK.

Q Mr. Campbell, I am going to have handed to you the original contract between the respondent and the Torrington Company, and ask you if you can tell us what the duration of that contract was to be, according to terms?

Mr. Branch: What is the date of that, may I inquire? May we have the date of that contract given so that we can identify it?

The Witness: August 11, 1930. The contract was to continue in force until June 1, 1944, unless terminated by one year's written notice to the Torrington Company, as provided in the preceding paragraph.

* * * * * * [455]

By Mr. Wahrenbrock: *Q* I direct your attention to the letter of December 1, 1932, to which you referred in your testimony yesterday, and ask you if that is the agreement you referred to modifying in some particulars the contract to which you have previously referred? *A* Yes, sir.

Q That made no change in the effective period of the contract or the termination provision of the contract? *A* No.

Q I now direct your attention to the letters of March 19, 1941, from the respondent to the Torrington Company and the letter of March 21, 1941, from the Torrington Company to the respondent, and ask you if those letters provide for the termination of the contract prior to 1944? [456] *A* Yes, they do.

Q And do those provisions purport to comply with the one-year termination notice provision of the first contract? *A* Well, this was an agreement that we could terminate the contract earlier than a one-year's notice.

Q Yes. *A* And it was determined that the contract would terminate.

Q And those letters did terminate the contract? *A* Yes.

* * * * * *

Mr. Wahrenbrock: May the three letters to which I last referred, be handed to the reporter for copying and shown in the record as read?

Trial Examiner: Would there be any great difficulty for the witness to read them into the record?

[457] The Witness: Shall I proceed, sir?

Trial Examiner: Yes.

The Witness: Letter dated December 1, 1932, to the Torrington Electric Light Company, Torrington, Connecticut, attention of Mr. C. E. Smith, Treasurer.

"Dear Mr. Smith:

"Confirming our conversation of yesterday and your telephone conversation with Mr. Day of the same date, my understanding is as follows:

"Beginning with November 1, all surplus power supplied to your company will be billed at 5 mills. A meter will be installed at the earliest convenience which will measure any power which we might furnish over and above the Torrington load, and which would find its way into the lines of the Connecticut Power Company.

"In making up your bill for this surplus power, the number of kilowatt hours will be the kilowatt hours as reported by the billing meter at Torrington, less any kilowatt hours registered by the meter which is to be installed to show the power which might have been used which might find its way into the Connecticut Power Company's lines.

"For the month of November, the bill shall be for the kilowatt hours actually supplied to your system as shown by the meter, less an estimated amount of 1,000 k.w.h. which we supplied the Connecticut Power Company."

[458] "Very truly yours,

"A. C. BRISTOL, Manager."

Letter dated March 19, 1941, to the Torrington Electric Light Company, F. M. Travis, President, Torrington, Connecticut:

"Dear Sirs:

"Referring to the agreement dated August 11, 1930, we propose to make the connection between our own transmission system and the system of what was formerly the Winsted Gas Company, and upon the completion of that connection, will undertake to supply ourselves with power, and discontinue taking electric power under the agreement referred to.

"In accordance with Section 12 of the said agreement, we hereby give you written notice of this intention on our part so that the agreement can be properly terminated.

"I understand that in accordance with my recent conversation with Mr. F. M. Travis, your president, he agreed to waive the one-year's notice of termination called for by this Section 12, and that as soon as our own facilities have been erected and completed so that we are in a position to supply power to ourselves, any obligation to take power from you will cease and terminate.

"It is estimated that we will be able to install these facilities, and have them ready in about six months' time.

"Will you kindly acknowledge the receipt of this notice?

[459] "Yours very truly,

"C. L. CAMPBELL, President."

Letter dated March 21, 1941, to the Connecticut Light and Power Company, Hartford, Connecticut, attention of Mr. C. L. Campbell, President.

"Dear Sir:

"We acknowledge the receipt of your letter of March 19, 1941, giving notice that under Section 12 of the agreement dated August 11, 1930, you desire to terminate this agreement. This will take place as soon as you can supply yourselves with power, requiring an estimated period of six months.

"We understand the impossibility of an accurate construc-

tion-time estimate and will waive any unused part of the one-year's termination notice required by our contract.

"Yours very truly,

"THE TORRINGTON ELECTRIC LIGHT COMPANY,
"By, F. M. Travis, President."

* * * * * * [*461*]

By Mr. Wahrenbrock: *Q* Mr. Campbell, is this contract which has been marked Exhibit 11, and the three letters which you read, the whole of the agreement under which electric energy has been sold by the Torrington Company to the respondent, and all modifications or changes in that contract?

* * * * * * [*462*]

The Witness: Do I understand that part of the question is from the period covered from August, 1935, up to the date of [*463*] this hearing?

By Mr. Wahrenbrock: *Q* Yes, sir. *A* No, they do not.

Q Will you explain? *A*. As I testified here yesterday, two or three weeks ago—I have forgotten the exact date—I meant to have looked it up this morning but unfortunately I forgot to do so—a different arrangement was entered into with the Torrington Company whereby the power to be supplied to us was generated at Torrington, at their steam plant, and none of the power which they received from the Connecticut Power Company was to be delivered to us, and the price to be paid was the same price which had formerly been paid under the old contract, plus the out of pocket expense that the Torrington Company incurred in operating its steam plant, less the amount that the Torrington Company would have paid the Connecticut Power Company if it had continued to receive from the Connecticut Power Company the power which it delivered to us.

Q Now, do I understand you to say that that is a purely oral agreement, negotiated between you and Mr. Travis? *A* Correct.

Q You referred in your testimony yesterday to a letter, concerning some of the terms of that agreement which you had written. Will you explain about that? [464] *A* I think I said that I thought I had written a letter, but I find upon examination of my files that that is not the case; no such letter was written.

Q Is this oral agreement the only understanding or agreement or modification other than those set forth in the contract, this and the letters you read?

Mr. Branch: From what date to what date?

By Mr. Wahrenbrock: *Q* For the same period as previously specified, that is, from August, 1935 to the time of this hearing. *A* That is all.

* * * * * * [466]

Q Will you explain now about the negotiations leading up to and following the March, 1941 modification of the contract? *A* I saw Mr. Travis.

Q What day was that? *A* I expect it was the day before my letter of March 19th.

Q So it would be on the 18th? *A* The 18th of March, I would expect. And I discussed the matter with him.

Q Was that the first time you had discussed it with anybody from the Torrington Company? *A* Yes.

Q Had there been any discussions with anybody of the Torrington Company prior to that time? *A* In respect to the arrangement that was then contemplated to be made?

Q With respect to any modification of the prior contract. *A* I don't think so.

Q You don't think so. Who had been handling that in your organization? *A* I had.

Q Had you had engineering advice? [467] *A* Yes, sir.

Q With whom had you discussed it on the engineering aspects?

Mr. Branch: Excuse me. The train was making a little noise. May I have the question read?

(The question is repeated.)

The Witness: I had discussed it with Mr. R. H. Knowlton, who

is the executive vice president of our company, and with J. E. King,—Mr. King is vice president in charge of engineering and construction, of our company—the feasibility, practicability and economics involved in our exercising the right that we had under the contract to supply our Winsted properties with power from our own system and discontinue purchasing power from Torrington. And they made a study, an investigation, and based upon that investigation, it indicated that it was an economically sound thing for us to do. We could save money by doing it.

Q When did you first take it up with Mr. Knowlton and Mr. King? *A* Well, I should say probably in February.

Q You initiated the inquiry? *A* Yes.

Q When did they complete their investigation and make a report? *A* I should say early in March.

[*468*] *Q* What was the occasion of your initiating the inquiry? *A* I don't know that I quite understand what you mean by "occasion".

Q What brought it to your attention? *A* Well, we are constantly looking over our situation to see whether we can obtain the necessary supplies, either of power or anything else, on a more advantageous basis than we are now supplying it, and that was one of the reasons.

Q What were the other reasons? *A* The other reasons were that we felt that we had understood that there might be some question in the minds of the Federal Power Commission whether the arrangements that then existed did or did not involve us in interstate commerce, and in pursuance of the long-established policy of the company to avoid any possible interstate commerce transactions, we looked into this thing and finding that it was profitable to do so and economically sound to do so, we authorized the work to be proceeded with.

Q In what you have just said, you speak of "we". Whom do you refer to? *A* The company.

[*469*] *Q* Well, what individuals? *A* Well, as I determine the policy of the company subject to the Board of Directors, I deter-

mined it, and obtained authority from the Board of Directors to spend the necessary money to make the interconnection.

Q Was it a matter that had been brought to your attention by your attorneys? *A* You mean the economic soundness of this?

Q The matter of obtaining a new source of supply. *A* No, I can't say that it was. We had discussed the fact that there was this situation there, and that it was believed that the Federal Power Commission might claim that that was a transaction in interstate commerce.

Q Who had discussed that? *A* Myself and our attorneys.

Q The attorneys of Day, Berry & Howard? *A* Yes.

Q When did those discussions take place? *A* Oh, I don't know.

Q Did they take place after January 7, 1941? *A* Well, I can't recall the date. We had so many discussions with Day, Berry & Howard—they are our general counsel—we are in constant consultation with them, and I can't recall any particular date.

Q You did discuss this matter with your attorneys before [470] taking it up with the Board of Directors? *A* Oh, yes.

Q Was this matter initiated by your attorneys or by you? *A* It was initiated by me.

Q The discussion was initiated by you? *A* The discussion?

Q Yes, with your attorneys. *A* That I can't recall. I don't recall who initiated the discussions.

Q Unless your attorneys brought it to your attention, what happened that might have brougt it to your mind that this was a matter to be considered? *A* Well, as I say, the general practice of the Company was to constantly review all of our matters with a view of determining whether we can improve from an economic or service point of view our business methods.

Q Had such a review been made for you by any of your staff? *A* Yes, I just stated it had been made.

Q By whom? *A* By Mr. Knowlton and Mr. King.

Q No, I refer to preceding the time you asked them to make a study. *A* No.

Q There had been no general review which brought up this [*471*] or any other matter for your consideration? *A* No.

Q Then what did bring it to your mind the first time? *A* Well, I can't recall, sir, what brought it to my mind.

Q Did anything else bring it to your mind than the suggestion by the attorneys? *A* It might have. I don't know.

Q But you don't recall that anything else did? *A* No, nor I don't recall that it was their suggestion that it was.

Q But you do recall you did discuss this matter with them before you took it up with your Board of Directors? *A* Yes.

Q Did your attorneys give you any written opinion or memorandum in connection with the matter? *A* Oh, no.

Q Do you recall discussing it more than once with them? *A* Well, I think it depends what you mean by recall. I don't actually visualize any particular occasion when I did talk to them at all about it. But I do know that the matter was talked over. Whether it was talked over once or twenty times, I couldn't begin to tell you. I expect what happened was that after discussing it with the attorneys, then having received the reports from the engineers which indicated that from an economic standpoint it was the proper thing for us to [*472*] do, we then took it up with the Board of Directors, obtained the appropriation, or the authority to make the necessary capital expenditure, and then I went over to negotiate with Mr. Travis, whether or not he would hold us to that full one-year's notice or would let us off in case we were ready to do it earlier.

* * * * * * [*473*]

By Mr. Wahrenbrock: *Q* You stated that the company already owned part of the right-of-way by which it proposes to obtain a new source of supply for Winsted? *A* All of it.

Q All of it? *A* Yes.

[*474*] *Q* Between what points does that right of way lie? *A* Well, I am not sufficiently familiar with the layout of our lines to explain.

Q From which extremes, roughly. *A* Roughly, from Waterbury up to the line of Winsted.

* * * * * * [478]

Q I believe you stated earlier that you conducted the negotiations leading up to the more recent further modification of the power contract, or the recent agreement for a new source of supply in Torrington, pending the completion of your own source of supply? *A* Yes.

Q Did you initiate that proposal? *A* My recollection is that that idea first came to me from one of our engineers, who stated that he had understood that the Torrington Company had quite recently completed a revamping of its steam plants, and that if his information was correct, that that steam plant was then of adequate capacity to supply our entire Winsted load, and therefore it might be a good idea to hitch our load to that Winsted plant—I mean the Torrington plant, to give the Torrington plant a chance to be tried out in actual service.

Q Why did he make that suggestion to you? *A* I don't know.

Q Who was he? *A* I don't recall. One of our engineers.

Q Was it Mr. Knowlton or Mr. King? *A* It was probably Mr. King.

Q Mr. King was familiar with the company's desire to avoid a ground for the Federal Power Commission asserting jurisdiction? *A* Oh, yes. Everybody in the company is well aware of [479] that. That has been well advertised.

Q And the proposal was made along that line? *A* I don't know exactly. That may have prompted him to do it.

Q It offered a further means of accomplishing that result? *A* Yes.

Q And that was the reason for its consideration by you? *A* Yes.

* * * * * * [480]

By Mr. Wahrenbrock: *Q* Mr. Campbell, is your company now receiving electric energy from the Torrington Electric Light Company at Winsted? *A* Yes, sir.

Q How is that being supplied now? *A* Over a line which is connected to the steam generating plant of the Torrington Electric Light Company.

Q And is that a new temporary line? *A* No, it is a line that was used for the service before this present arrangement.

Q Using the existing switching facilities of the Torrington Electric Light Company? *A* That is an engineering feature, which I cannot testify to.

Q You don't know whether some temporary construction was put in? *A* Oh, yes, sir; I know that a short piece of temporary construction was put in to connect the line directly with the steam power plant of the Torrington Electric Light Company.

Q Some of your engineers have knowledge of the details? *A* Yes, there will be an engineer, I believe, who will testify to that. Not being an engineer, I hesitate about trying to do so.

[*481*] *Q* And at the present time, you are receiving electric energy which is being generated by the Torrington Electric Light Company in its Torrington steam plant? *A* Yes, sir.

Q How long has that been true? *A* Well, I should say it is almost a month—three weeks. Frankly, I have not got the exact date here. It is ascertainable.

* * * * * * [*483*]

By Mr. Wahrenbrock: *Q* Mr. Campbell, I wish to refer now to the contract which your company had with the Borough of Groton, first the contract made the 31st day of March, 1930, and ask you whether that contract, which is attached to the stipulation which has been signed by counsel was ever filed in the form prescribed by the Federal Power Commission orders 36, 44 and 50?

* * * * * *

By Mr. Wahrenbrock: *Q* Has that contract been filed with the Federal Power Commission since August 26th, 1935?

Mr. Branch: I am not sure whether the question means on [*484*] file although actually sent before that time, or the filing since that time. I think that matter should be clarified.

Trial Examiner: As I understand your question, Mr. Wahren-

Brock, what you want to know is whether it has been filed at any time since August 26th, 1935?

Mr. Wahrenbrock: Yes, sir.

Trial Examiner: With that understanding, you may answer the question.

The Witness: The company did undertake and endeavor to file with the Commission in January, 1935, all existing contracts of this character, and it is my belief that the file was complete. It is a large company, and it may have been that some contract was inadvertently omitted from that filing made in January, 1935, therefore, I cannot answer from my recollection whether this particular contract which would have been filed unless it had been overlooked, in January, 1935, was subsequently filed again after August, 1935. I don't recall; I don't know.

By Mr. Wahrenbrock: *Q* On your direct examination, as I recall, you stated that the statement in one of the sub-paragraphs, paragraph 12 of the answer that additional contracts and modifications had been filed was erroneous, and I wanted to follow that up and for that purpose I will ask you whether the agreement of June 5, 1935 between the Connecticut Light and Power Company and the Borough of Groton was filed with the Federal Power Commission? [*485*] *A* I don't recall just what has been filed in a particular instance, with the Commission. I do not keep it in mind. The files of the Commission ought to disclose whether it has been filed or not.

Q Mr. Campbell, I believe you stated on direct examination that you have had a study made to determine what had been filed? *A* Yes, sir.

Q And did that study show you whether this agreement had been filed? *A* I have refreshed my memory. I find that the investigation shows that additional contracts with other utilities have not been filed.

Q And those contracts would, of course, include this contract? *A* Yes.

Q The one which is attached to the stipulation, dated June 5, 1935? *A* Yes.

Q And the same thing is true of the memorandum of agreement between the Connecticut Light and Power Company and the Borough of Groton, executed the 15th day of November, 1935?

Mr. Branch: What is that?

Mr. Wahrenbrock: That is attached to the stipulation and follows after the one I last referred to. I will show it to the witness. The date is at the end of the agreement.

[*486*] (Handing paper to the witness.)

Mr. Branch: The "same being true",—meaning that it was not filed? Is that the meaning?

Mr. Wahrenbrock: That the study made by the witness shows that it was not filed.

The Witness: The study that we made shows that all of the things that were referred to in paragraph 12 of the answer were filed, except our additional contracts with other utilities.

Now, I find it frankly very difficult, with the large number of contracts that we have, to be precise as to any one particular contract, and I would take it from this study that has been made that this contract has not been filed, but I do not want to be put in a position of giving false testimony if it should develop that that particular contract was filed in connection with some other matters, perhaps.

By Mr. Wahrenbrock: *Q* I understand, and my information is, that they were not filed, and I wanted to give you an opportunity to state whether any of them had been filed. *A* Not so far as I know.

Q And the study was made for the purpose of ascertaining whether they had been, and it does not reveal that this agreement of November 15th, 1935, was filed? *A* That is right. May I just say this. There is just [*487*] one possible misunderstanding, that there might be on this, that I think in justice to myself I ought to clear up. The reference is made to other utilities in our answer, item 12, and also in the memorandum that was given to me, of the study that was made. Now, whether the Borough of Groton would be held by this to be another utility—

Q (Interrupting) But you have no knowledge or basis for say-

ing that these I have referred to with the Borough of Groton have been filed with the Federal Power Commission? *A* Probably they were not filed.

Mr. Branch: By "those that were referred to" you referred to the recent ones, and not to the original one, Mr. Wahrenbrock? There have been so many that I would like to have that clear.

Trial Examiner: Do you mean, Mr. Wahrenbrock, that you referred to the ones dated June and November, 1935?

Mr. Wahrenbrock: I mean all of those with the Borough of Groton to which I have referred except that one dated March 31, 1930.

Trial Examiner: Does that clarify the point, Mr. Campbell?

The Witness: Yes, sir.

Mr. Branch: Is there a question pending now, sir? I think perhaps Mr. Campbell answered your question, but not the one pending. I suggest that we have a new question now.

By Mr. Wahrenbrock: [488] *Q* In other words, Mr. Campbell, the Company has not filed any of its contracts for the sale of power for resale since the contracts which were filed very early in the year 1935, in response to the inquiry sent out in connection with our National Power Survey? *A* That is correct.

* * * * * * [502]

Redirect Examination by Mr. BRANCH.

* * * * * * [509]

ALVAN WALDO HYDE,

a witness called on behalf of the Respondent, being first duly sworn, testified as follows:

Direct Examination by Mr. BRANCH.

Q Mr. Hyde, will you state your name. *A* My name is Alvan Waldo Hyde.

Q Where do you reside? *A* In Hartford, Connecticut.

Q What is your position? *A* I am an attorney at law.

Q Will you please state your education and experience. *A* I was educated in the public schools of Hartford, graduated from the Yale University in 1902, and from the Harvard Law School in

1905. I began the general practice of law in that year with the firm of Gross, Hyde & Shipman, and continued with Gross, Hyde & Shipman after it became Gross, Gross & Hyde, and then Gross, Hyde & Williams, and that is the present name of the firm. I continued with the firm until I was appointed to the Public Utility Commission of Connecticut, [*510*] in November, 1934, by Governor Cross. From that date to the present I have been giving substantially all my time to the duties of that Commission. My specified term ended on June 30, 1941.

Q In what courts have you practiced? *A* In the courts of the State of Connecticut, United States District Court for the District of Connecticut, the United States Supreme Court, and the United States Court of Claims.

Q Are you familiar with the Connecticut statutes relating to the incorporation and operation of the public utility? *A* I am.

* * * * * * [*514*]

By Mr. Branch: *Q* What authority is necessary for the conduct of the Public Service Electric companies in Connecticut?

Trial Examiner: I don't think that question is material.

Mr. Branch: I think you stated that under an unfavorable ruling an exception is noted, and I think that applies to questions of mine when the objection is sustained.

Trial Examiner: That is right.

* * * * * * [*519*]

Mr. Wahrenbrock: May I ask to have the pending question read?

Mr. Branch: I will be glad to read it: "If an electric company incorporated in Connecticut does all of its business in Connecticut, owns or operates no property outside of Connecticut, owns or operates no lines connecting at the Connecticut State line with any other utility, has no contract or arrange- [*520*] ments for the sale or receipt of electric energy outside of Connecticut or at the Connecticut State line, purchases no electric energy from a company which generates it outside of Connecticut, and sells no electric energy to a company located outside of Connecticut, has the Connecticut Public Utilities Commission jurisdiction over all of the

rates, facilities and contracts, wholesale and retail, of that company?

Mr. Wahrenbrock: Mr. Examiner, carefully listening to that question as it was re-read, I can see absolutely no relevancy under the decisions of the Commission or the decisions of the courts to that statement.

Trial Examiner: I would suggest that it be limited. If counsel desires to ask whether the Public Utilities Commission has so considered its authority, that is another question.

Mr. Branch: I was going to ask that later. I would like to get his conclusion first.

Trial Examiner: I do not think that his conclusion, except as to what the attitude of the Commission is, would be material here, in view of the fact that the question may more properly be made a matter of briefs.

* * * * * * [*521*]

By Mr. Branch: *Q* I will ask this question—whether the Connecticut Commission has asserted authority over contracts, retail and wholesale, and over the rates and facilities of such companies as I have described.

* * * * * * [*522*]

Q Now, Mr. Hyde, will you answer the question in regard to what the Public Utilities Commission of Connecticut has done, and cite, if you will, cases in which the Connecticut Commission has acted, and cases in the courts of this State? *A* The Connecticut Commission has acted and asserted jurisdiction in such cases. There have been several decisions of the courts to the effect that utility rates existing pursuant to contract are subject to modification through the rate-making authority of the Public Utilities Commission. These decisions do not depend in any degree upon the nature of the rate, either as to quantity or classification of customers. The principle followed is a broader one, that a State may not be deprived of its authority under its police power by the execution of a private contract. Some of these decisions are *Ansonia v. Ansonia Water Company*, 101 Conn., 151.

Trial Examiner: Are these decisions of your Commission?

The Witness: Two of them are appeals from the decisions of the Commission, decided by the Supreme Court of the State, upholding the power of the Commission.

* * * * * * [*525*]

Q The question I asked you is this question. I think it is numbered 9 in the draft you have there:

Is a contract for the sale of electric energy at wholesale, that is, to a company which is to distribute and resell it, subject to the jurisdiction of the Connecticut Commission if all of the facilities of both of the parties to it are located in Connecticut?

Mr. Wahrenbrock: Now, Mr. Examiner, I am going to specify a further ground of objection, that insufficient facts have been shown to express an opinion. It does not appear where the energy is consumed, it does not appear where it is generated. Those are some facts which should be in such a question.

[*526*] Trial Examiner: The point is well taken in that respect. I think a hypothetical question should be complete.

Mr. Branch: Do I understand the objection is sustained?

Trial Examiner: Objection sustained.

Mr. Branch: I except on the ground that that in itself is a complete statement, that these other things need not be considered, and I offer to prove that the answer to that question would be in the affirmative.

* * * * * * [*527*]

Q Mr. Hyde, if under a contract for sale at wholesale of electric energy between two Connecticut companies, it appeared that some of the energy sold had been generated outside of the State before it was purchased by and delivered to the seller within the State, and if it was then transmitted within the State by the seller, would that affect the jurisdiction of the Connecticut Commission over the rates and the contract?

Mr. Wahrenbrock: Mr. Examiner, I will object to that. That will require a consideration of Utah *vs.* Pfost, and the Duke Power Company and all the other cases of the Supreme Court of the

United States on the subject, and we do not need to have an expert swear to them. We will have our own opinions on it in any event.

Trial Examiner: I think that is true. If he were limited as to whether it would make any difference to the State Commission in taking jurisdiction, that would be another matter. If you limited your question to that, it might be admissible.

Mr. Branch: I understand the objection is sustained?

Trial Examiner: Yes.

Mr. Branch: And I take an exception and I offer to prove [*528*] that the answer to the question which was just asked would be in the negative.

By Mr. Branch: *Q* And I will ask you, Mr. Hyde, whether the facts in the question which I just asked and that you did not answer, actually had prevented the Connecticut Commission from taking jurisdiction over rates and contracts?

Mr. Wahrenbrock: Mr. Examiner, on that point my objection is as previously stated, and in addition that it is wholly immaterial to any question under the Federal Power Act what the State Commission has as a matter of fact done. We do not need any evidence on that, and all the evidence in the world that they have assumed jurisdiction does not make any difference.

Trial Examiner: I think there may be a very slight and tenuous connection there. However, I will permit the answer.

The Witness: They have not.

By Mr. Branch: *Q* Will you explain, Mr. Hyde.

Mr. Wahrenbrock: I object to that for the same reason, Mr. Examiner.

Trial Examiner: I think the explanation is out of order. The fact of what the Commission has or has not done may be in order, but not the explanation why.

Mr. Branch: I should like an exception to what I understand is a ruling sustaining the objection as to the question.

[*529*] Trial Examiner: Yes.

Mr. Branch: And I will say I would offer to prove that the Public Utilities Commission of Connecticut has complete jurisdic-

tion over the rates in any contract that is wholly performed within the State, that the Connecticut Commission, although the Connecticut Commission would not have jurisdiction over rates and contracts between the seller and the company in the other States which sold it the power which was generated in another State, if the contract is between a company which ultimately purchased the energy and its seller, the mere fact that the energy was purchased and had been generated outside of the State would not make any difference and has not made any difference in the practice of the Connecticut Commission.

Mr. Wahrenbrock: Mr. Examiner, I would like to move at this point that this entire line of questioning be stopped. It is taking time. It is serving only the purpose of having lawyers argue law at the hearing, and as I suggested, this is a fact finding hearing and not a law finding hearing. We will take care of the law in our briefs. Counsel is, of course, entitled to make his offers of proof if he sees fit to do so, but I suggest that he be allowed to make his offers of proof in his brief instead of taking time and having it transcribed by the reporter.

Trial Examiner: Suppose we listen to the completion of [*530*] his offer for the present. Is that all you have to offer on that now?

Mr. Branch: No, sir, I have quite a bit more.

Trial Examiner: I was going to ask you if that was a general question of law or an offer of proof.

Mr. Branch: I am sorry, I did not hear what you said, Mr. Examiner.

Trial Examiner: I was going to ask you if you were making a general statement of the law or just a statement of what you proposed to prove by the witness as to the practice of the Connecticut Commission?

Mr. Branch: That I said was just a statement of what I offered to prove by the witness.

Trial Examiner: As to the practice of the Connecticut Commission?

Mr. Branch: Yes.

Trial Examiner: And not as to the law generally?

Mr. Branch: No, sir.

By Mr. Branch: *Q* Has the Connecticut Commission the power and the duty to prescribe a uniform system of accounts for electric companies in the State of Connecticut?

Mr. Wahrenbrock: I object to that for the reasons as stated, Mr. Examiner.

Trial Examiner: I will permit the witness to answer the [*531*] question.

The Witness: It has.

By Mr. Branch: *Q* Has the Connecticut Commission prescribed such a uniform system, and if so, will you state where such a system was prescribed and changed from time to time?

Mr. Wahrenbrock: I object to that question, Mr. Examiner.

Trial Examiner: I question the materiality of that. The Commission has ruled in previous cases that the fact that a uniform system of accounts was prescribed by State Commissions and that the utility was obliged to submit to that uniform system of accounts has no relation to the necessity for them coming under the Federal system of accounts if they were public utilities within the Federal statutes. They are not relieved by the fact that they are required to file with the States.

Mr. Branch: Your Honor's answer sustains the objection?

Trial Examiner: I sustain the objection that it is not material.

Mr. Branch: And I take an exception. I offer to prove that the Commission has prescribed such a system, that at first such a system was first prescribed in November, 1923, that it was revised, the revision to become effective January 1, 1941, so as to adopt with a few modifications the System of Accounts approved by the National Association of Railroad and Utilities Commissioners.

* * * * * * [*540*]

By Mr. Branch: *Q* I have asked you several questions in the present tense, Mr. Hyde as to what the Connecticut Commission is doing, and what authority it has, and I ask you whether the

answers to all of the questions which I have asked would be the same as of the entire time since August 26, 1925?

Mr. Wahrenbrock: I object on the grounds previously stated, and on the further ground that the question is so broad as to be— I object on the same grounds as previously stated.

Trial Examiner: The objection is sustained.

Mr. Branch: If the objection to the question is sustained on the ground that it is too broad, I will have to go back—

Mr. Wahrenbrock: I withdraw that.

[*541*] Mr. Branch: I offer to show that the present powers of the Commission have been unchanged in respect to the matters which I have asked about, since July 1, 1935. The Commission has exercised full authority continuously since that time. And that applies not only to the questions which the witness was permitted to make answer to, but also to the questions as to which objection has been sustained.

* * * * * * [*546*]

Q Mr. Hyde, in the course of your service as Commissioner of Public Utilities, did you form an opinion as to the meaning of the terms "Facilities for transmission", and "Facilities for local distribution of an electric company"?

Mr. Wahrenbrock: I must ask that that question be read.

Trial Examiner: Will you read it?

(Whereupon the last question as above recorded, was read by the reporter.)

Mr. Wahrenbrock: Mr. Examiner, I must object to trying to prove by an expert as to the construction to be put on the terms in the Federal Power Act.

* * * * * * [*548*]

By Mr. Branch: *Q* Have you had occasion, Mr. Hyde, to consider the meaning of these terms in regard to the facilities of an electric company such as the Connecticut Light and Power Company, in connection with its relations to the Public Utilities Commission of Connecticut? *A* Yes.

Q And what, in your opinion, is the meaning of the term "facilities for transmission" and "facilities for local distribution", of an electric company?

Mr. Wahrenbrock: I object to that. It is not specified as to the purpose for which the terms are used, or where they are used.

Trial Examiner: If you will restrict that to the Connecticut law, I think the witness can answer it—to the Connecticut Commission Statute.

Mr. Wahrenbrock: I should like to observe, Mr. Examiner, that it also should be further tied to what particular statute, [*549*] what particular purpose the connotation is, the context in which the terms are used, if they are used, and it hasn't even been shown that they are used. Terms may have one meaning when used in one connection and another when used in another. We will have to have some basis laid before such a question can become relevant.

Trial Examiner: I think if there is more than one sense in which it is used in the Connecticut statute, the Commissioner may be able to explain that.

Mr. Branch: Do I understand, your Honor—

Trial Examiner: If you will limit yourself to the Connecticut law.

Mr. Branch: If your Honor, as I understand, sustains the objection to the broader form of the question I wish to present—and I understand my broader form is objected to,—

Trial Examiner: It is objected to and it is sustained, and you have an exception,

Mr. Branch: I will put the question now which you suggest.

By Mr. Branch: *Q* Did you hear the Examiner's question, Mr. Hyde, the Examiner's suggestion as to the form of the question? *A* I don't know whether I formed any opinion as to the use of either words as used in a particular statute.

Mr. Branch: Will you read the Commissioner's comment just before I spoke?

[*550*] (The record was read.)

By Mr. Branch: *Q* Have you had occasion in connection with

your duties with the Connecticut Public Utilities Commission, to use those terms, as applied to the Connecticut Light and Power Company, Mr. Hyde?

Mr. Wahrenbrock: I object to that unless it be specified what purpose the terms are used for, and the purpose shown to be relevant to the present inquiry.

Trial Examiner: I think that it advisable that it be tied to the present inquiry. There is some question as to the degree to which it applies. It may be wholly immaterial.

Mr. Branch: The objection is sustained, I take it, and may my exception be noted?

Trial Examiner: Your exception will be noted.

Mr. Branch: Before making the offer, I will go a little further.

By Mr. Branch: *Q* Does the Connecticut Uniform System of Accounts contain a definition of those terms, or either of them, Mr. Hyde?

Mr. Wahrenbrock: Mr. Examiner, I object to that question as having no relevancy.

Trial Examiner: It is not material.

Mr. Wahrenbrock: May I amend my remarks by saying that what meaning terms may be given for accounting purposes is [*551*] obviously an arbitrary meaning to serve the ends which accounting serves. A given facility may not warrant being classified accurately, so that it must be fitted into an arbitrary classification, and what a term may be given as a meaning for accounting purposes has no necessary relation whatever to the meaning of that term when used for engineering purposes or when used in a statute for other than accounting purposes.

Trial Examiner: I think the point is well taken and it is immaterial anyway as to what the definition in the Connecticut law is. That is irrelevant to this case.

Mr. Branch: Please note my exception to that ruling.

Trial Examiner: Your exception will be noted.

Mr. Branch: I will just say it seems to me the only way to show the meaning of terms is to show how they are used and defined,

and the attempt of counsel for the Federal Power Commission to question a meaning which has been adopted not only by the Connecticut but also by the Federal Power Commission itself, seems to me rather thin.

Mr. Wahrenbrock: I must resent that comment, and I must explain I have not objected to any offer of proof to show the technical meaning of a term used for the purpose for which any term is used in the Federal Power Act. I have objected to offers of proof to prove the same terms used for different purposes in something unrelated to the Federal Power Act.

Trial Examiner: I think your position is well taken. [*552*] The objection, Mr. Branch, was to the use of it in the Connecticut statutes, and the question has not been raised as to the definition of the term in the Federal Power Act.

Mr. Branch: I hope you will understand, sir, I am not trying to get you to change your ruling after you have ruled. It is my practice not to do that, where I feel you have considered the matter, as I have realized that you have, but to protect my rights, I wish to go ahead in this way. I have forgotten whether I have asked this question or not.

By Mr. Branch: *Q* Have you an opinion as to the meaning of the terms "facilities for transmission" and "facilities for local distribution" of an electric company, as used generally in the industry, Mr. Hyde?

Mr. Wahrenbrock: I object to that in the absence of a showing that the terms are used, and the purposes for which they are used, and the specification of the purposes for which they are used.

Trial Examiner: I think the question is not sufficiently narrowed to show its application.

Mr. Branch: I would like an exception.

Trial Examiner: You may have an exception.

Mr. Branch: I offer to show that the distinction between the terms must be found from a study of the functions which such facilities are intended to perform. [*553*] I have forgotten

whether I have asked this question or not, and you will understand I am not trying to get you to change your ruling if I have.

Mr. Wahrenbrock: I—

Mr. Branch: May I have ordinary decency and be allowed to go ahead?

Mr. Wahrenbrock: Certainly. I wished to ask to have your offer of proof read. I didn't understand.

Mr. Branch: Will you wait until I have finished?

Trial Examiner: I think that Mr. Wahrenbrock made the same mistake I made in thinking you were starting to ask another question. You may complete your offer of proof.

Mr. Branch: I wish to show that the Connecticut system of accounts contains a definition, and that the definition includes the following:

> "Stations which change electric energy from transmission to distribution voltage shall be classified as distribution stations."

Now, Mr. Wahrenbrock, if you wish something to be read, I will pause.

Mr. Wahrenbrock: Mr. Examiner, may the reporter read the offer of proof?

Trial Examiner: The reporter will read the full offer of proof. I think this is probably an appropriate time to take a re- [554] cess.

(A short recess was here taken.)

(After a short recess, the hearing is resumed.)

Trial Examiner: The hearing will be in order. The reporter will read the offer of proof as requested.

(The same is read as follows:

> "Mr. Branch: I offer to show that the distinction between the terms must be found from a study of the functions which such facilities are intended to perform.")

Mr. Wahrenbrock: Mr. Examiner, as to the proof of that fact

I have no objection, but I have not understood any of the questions which were asked and to which I made objection as calling for that answer, and I believe therefore that the offer of proof goes outside the reasonably to be anticipated answers to the questions which were asked, and if a question is asked which calls for proof on that point, I think then we can let the offer of proof which has been made, stand.

Mr. Branch: I think I also stated, either before or after that, stations which change energy from transmission to distribution voltage shall be classified as distribution stations in the Connecticut Accounts.

By Mr. Branch: *Q* I will ask you, Mr. Hyde, so that there will be no doubt about it, whether in your opinion, the distinction, if there is any distinction between the terms "facilities for [555] transmission" and "facilities for local distribution", of an electric company, must be found from a study of the functions which such facilities are intended to perform?

Mr. Wahrenbrock: If you will pardon my slowness in grasping what you read with such facility there, Mr. Branch, I would like to have that read.

(The question is repeated.)

Mr. Wahrenbrock: Mr. Examiner, that question does not specify the purpose for which the distinction referred to, if any, is a distinction. Because of that failure to specify that, I object to the question.

Trial Examiner: It is very general in its language, and the answer suggested by your offer of proof would not be objectionable, but what it would lead to that is material, I cannot determine.

Mr. Branch: I thought that I was following precisely the suggestion which had been made by counsel on the other side. After I had done that I find it is still objectionable. I asked whether for all purposes that you know of for classifying facilities for transmission and facilities for local distribution of an electric company, Mr. Hyde, the distinction must be found from a study of function which such facilities are intended to perform?

Mr. Wahrenbrock: Because the question says "for all purposes" and I think it is too broad and I must object to it [556] on that ground.

Trial Examiner: Do you mean for each purpose, or for all purposes? Do you persist in making it for all purposes, or would you make that question, "for each purpose"?

Mr. Branch: I prefer to frame it, sir, the way I have.

Mr. Wahrenbrock: I object to it as framed.

Trial Examiner: I think as framed the question shows no sufficient relation to the case at issue and the objection will be sustained.

Mr. Branch: My exception is noted, and I offer to prove that the answer to that question would be in the affirmative.

By Mr. Branch: *Q* I ask you whether for all purposes you would regard stations which change energy from transmission to distribution voltage as distribution stations?

Mr. Wahrenbrock: I object to that question for the same reason.

Trial Examiner: I think the objection is proper.

Mr. Branch: And may my exception be noted?

Trial Examiner: Your exception is noted.

Mr. Branch: And I offer to prove that the answer would be in the affirmative.

By Mr. Branch: *Q* Do you know whether there is a classification or definition of "facilities for local distribution" of an electric [557] company in the uniform system of accounts for public utilities of the National Association of Railroad and Utilities Commissioners?

Mr. Wahrenbrock: I object to that question on the same grounds as I objected to formerly to the testimony for the definition of the terms "for accounting purposes."

Trial Examiner: I fail to see the relevancy of any provisions adopted by the National Association. Objection sustained.

Mr. Branch: Exception. I offer to prove that in the system to which I have just referred is substantially the following:

"Stations which change energy from transmission to distribution voltage shall be classified as distribution stations."

By Mr. Branch: *Q* Do you know whether the uniform system of accounts of the Federal Power Commission contains any definition or classification which would include facilities for local distribution, Mr. Hyde?

Mr. Wahrenbrock: Mr. Examiner, I object to that question. The Commission can certainly notice the terms of its own uniform system of accounts.

Trial Examiner: The objection is in order.

Mr. Branch: May my exception be noted.

[*558*] Trial Examiner: Yes.

Mr. Branch: I offer to prove that it contains the following—it may not be verbatim, for I cannot lay my hands on the original, but my notes indicate:

"Stations which change energy from transmission to distribution voltage shall be classified as distribution stations."

Mr. Wahrenbrock: Mr. Examiner, can we not avoid some unnecessarily misleading offers here?

Trial Examiner: I do not think the offers of proof need be gone into in detail in regard to the answers to the questions.

Mr. Wahrenbrock: I have no recollection that there is such a provision in our uniform system of accounts. I may be in error.

Mr. Branch: I will show it to you. I respectfully bow to your Honor's ruling, but I must say that in no other tribunal in which I have practiced, have I ever had counsel object to my making offers of proof to preserve my rights.

Trial Examiner: That is all right for you to go into then, in as narrow a compass as possible. I am inclined to think that in a few cases you have gone a little beyond the necessities of an offer to prove, and I would suggest that you confine it to as narrow bounds as possible.

Mr. Branch: I could have gotten all through these offers if I had not been continually interrupted. I am finding it a [*559*] little

difficult to be patient with continual interruptions. It seems to me that we do have certain rights here to protect our rights. On page 52 of the Federal Power Commission's uniform system of accounts appears—this edition I have is revised to December 31, 1936, effective January 1, 1937, and I will read the whole title.

> "Uniform system of accounts prescribed for public utilities and licensees, subject to the provisions of the Federal Power Act."

I call attention to all the paragraphs marked 16, or the Section marked 16 on page 5, and particularly the following which is designated as among "Stations which change energy from transmission to distribution voltage shall be classified as distribution stations."

* * * * * * [566]

Mr. Howard: May it please the Examiner, we ask that the Commission take notice of the following sections of the statutes of Connecticut. Referring first to the General Statutes, Revision of 1930, we ask that they notice Sections 522 to 543 inclusive. We ask that they notice Sections 3577, 3587 inclusive. Also Sections 3589 to 3594 inclusive. Also Sections 3596, 3598 and 3599 and 3600, and Sections 3606 to 3609 inclusive. There is a question here whether I mentioned 3602, 3603 and 3604. I supposed I had, but I do desire that the Commission take notice of those sections.

Trial Examiner: You had not.

Mr. Howard: Then at the expense possibly of repeating, Sections 3606 to 3609, inclusive; Sections 3614, 3617, 3619, 3817, 3820, 3822, 3827, 3832 to 3835 inclusive. And Sections 3846 and 3847. Section 5970. And then in the Cumulative Supplement to the General Statutes—and this is for the year 1935—Sections 1412-C to 1415-C inclusive. Also for the year 1935, Section 1420-C to 1423-C. Then for the year 1939, continuing in the Cumulative Supplement, Sections 1197-E to 1198-E, pointing out that 1198-E is the same as Section 711-D of the previous

session. Also there have been three Acts affecting utilities which have been passed by the present session of the General Assembly [567] and which became effective July 1st, but unfortunately have not yet been engrossed, and for that reason I have not yet been able to get a copy.

Trial Examiner: Will you be able, before the hearing is over, to get me the bill number or the Act number in case they are not in volume form yet?

Mr. Howard: The Revision Commissioner has his work to do and whether he will get it done before the end of the session, I am not certain. I can give you now the Bill numbers, I believe. Substitute Senate Bill 512, and Substitute Senate Bill 513. The other is a bill which was raised in committee and I believe has no number, but it related to rural extensions of electric lines. I honestly expected to be able to furnish copies before this hearing is concluded.

* * * * * * [*612*]

ALBERT N. TIFFANY,

a witness produced on behalf of the Federal Power Commission, being first duly sworn, testified as follows:

Direct Examination by Mr. WAHRENBROCK.

Q You have given your name to the reporter. Now, will you give your address. *A* My business address is 359 Thames Street, Groton, [*613*] Connecticut.

Q Mr. Tiffany, what position do you hold? *A* I am called superintendent of the Borough of Groton Water & Electric Department.

Q Is that a department of the Borough of Groton? *A* That is a department of the Borough of Groton.

Q What is the relation, if any, of that department to the Board of Utility Commissioners? *A* The Board of Utility Commissioners are the operating commissioners for the utilities of the Borough of Groton.

Q That board is a part of the government of the Borough of Groton? *A* No.

Q How are its members appointed? *A* Its members are appointed one each for four years.

Q By whom? *A* The wardens and burgesses of the Borough of Groton, the governing body.

Q Is there another adjoining borough to the Borough of Groton known as the Borough of Groton Long Point? *A* Yes, sir. That does not adjoin the Borough of Groton; it is in the same town, but does not adjoin the Borough of Groton.

Q It is a separate borough? *A* That is right.

[*614*] *Q* Separately governed? *A* Yes, sir.

Q Is there any connection between the Board of Utility Commissioners of the Borough of Groton and the Borough of Groton Long Point? *A* No.

Q What is your position in that department? *A* I am superintendent appointed by the Utility Commissioner.

Q How long have you been superintendent? *A* Nearly fourteen years.

Q Did you have a connection with that department prior to your appointment as superintendent? *A* Yes, as an employee.

Q As an employee? *A* Yes.

Q What is the total length of time you have been associated with the department? *A* Approximately fourteen and a half years.

Q Are you an engineer? *A* I am registered in the State of Connecticut as an engineer.

Q And you were educated as an engineer? *A* No.

Q Will you describe what documents and papers you have brought with you in response to the subpoena duces tecum [*615*] which was served upon you? *A* I was subpoenaed to bring four documents.

No. 1, the agreement of March 31, 1930, between the Borough of Groton and the Connecticut Light & Power Company for the

sale of electric energy to the Borough of Groton. I have that document.

No. 2: The agreement of June 5, 1935, between the Borough of Groton and the Connecticut Light & Power Company amending the agreement of March 31, 1930. I have that document.

No. 3: The agreement for the sale of electric energy by the Connecticut Light & Power Company to the Borough of Groton under which sales have been made to the Borough of Groton since the termination of the agreement of March 31, 1930, as amended. I have that document.

No. 4: The agreements dated March 1, 1929, and June 15, 1935, between the Borough of Groton and the Fishers Island Farms, Incorporated, for the sale of electric energy to Fishers Island Farms, Incorporated. I have part of that document; the first part dated March 1, 1929 I am unable to find in my records.

Q Mr. Tiffany, did you bring any reports or correspondence or memoranda, legal opinions, minutes of meetings of the Board of Utility Commissioners? *A* Yes, sir.

[*616*] *Q* With relation to those agreements that you have spoken of? *A* Yes, sir.

Q Have you those with you? *A* The greater part I have with me.

Q Will you describe what you have done to locate and bring those with you? *A* I have located the original documents as submitted to the Federal Power Commission upon their request concerning the Borough of Groton, the Connecticut Light & Power Company, the Fishers Island Farms, Incorporated, correspondence between Fishers Island Farms, Incorporated, and correspondence with and from the Federal Power Commission.

Q Those are all documents which you had submitted to the Federal Power Commission at its request prior to the service of the subpoena upon you? *A* All of those that I have been able to find are here. There are one or two omissions. They also include other documents which were pertinent to the facts requested to substitute for those which I do not have the original copies of.

Q If there is anything there that you have not previously called to our attention by correspondence or otherwise in response to our requests, I would like to have an opportunity to examine them outside of the hearing. For the present, I think we may pass that by. That completes your statement of what [*617*] you have done in response to the subpoena, does it? *A* Yes, sir.

Mr. Wahrenbrock: The Examiner will understand that Mr. Tiffany was subpoenaed to testify at the request of the respondent, and a subpoena duces tecum addressed to the Borough and to Mr. Tiffany was issued and served at the request of Commission counsel.

By Mr. Wahrenbrock: *Q* In what territory does the Borough of Groton Electric Department operate electric utility facilities? *A* In the Town of Groton and partially in the Town of Ledyard.

Q Does that territory extend beyond the limits of the Borough of Groton? *A* Yes.

Q Does it include part of the territory of the Borough of Groton Long Point? *A* Yes.

Q And does it include the territory between those boroughs? *A* Yes, sir.

Q In that area. are you engaged in the business of selling electric energy and distributing the same? *A* Yes, sir.

Q Will you describe in very general terms the nature of the facilities owned for that purpose? [*618*] *A* The facilities as owned by the Borough of Groton in that territory consist of a secondary sub-station at a point near the eastern boundary of the Borough of Groton. You will pardon me for asking this,—do you want me to describe it as it is as of today?

Q I just want a general description of the nature of your facilities. Let me make the question more specific. Does the Borough of Groton have any generating facilities? *A* No.

Q It is engaged only in distributing electric energy and transmitting electric energy throughout its territory? *A* Yes.

Q Where does the Borough obtain its supply of electric energy?

Where has it obtained its supply of electric energy since August, 1935? *A* From the Connecticut Light & Power Company.

[*619*] *Q* In the territory which you describe, is the Borough of Groton the only supplier of electric service? *A* Yes.

Q I show you an agreement dated March 31, 1930, which is part of the stipulation which has been offered in this case, and ask you if—and I show you also the following agreement attached to the same stipulation, being an agreement dated June 5, 1935, and ask you whether those are copies of the agreements under which the Borough of Groton obtained its supply of electric energy from the Connecticut Light & Power Company from August, 1935, until some recent time?

Mr. Branch: I object to the question on the ground "some recent time" is too vague.

Trial Examiner: I would suggest that Commission's counsel clarify his language in regard to that.

Mr. Wahrenbrock: At any time after August 26, 1935.

Trial Examiner: Until what time.

By Mr. Wahrenbrock: *Q* Are those contracts that I have referred to contracts under which the Borough of Groton has received electric energy from the Connecticut Light and Power Company at any time after August 26, 1935? *A* Yes.

Q How long did the Borough of Groton continue to receive electric energy under those contracts? [*620*] *A* Until September 29th, I believe, 1940.

Q Thank you. After that time, where did the Borough of Groton obtain its supply of electric energy? *A* From the same source.

Q Under what arrangement or agreement? *A* A letter of agreement.

Q A letter of agreement? *A* That is right.

Q Can you identify that letter? What was the date of the letter? *A* June 14, 1940.

Q I show you a letter of that date on the letterhead of the

Connecticut Light and Power Company attached to the same stipulation—

Mr. Branch: Excuse me. May I have the last question and answer read?

Trial Examiner: The reporter may read it.

(Whereupon the last question as above recorded, was read by the reporter.)

Q (Continuing)—attached to the same stipulation to which I previously referred, and ask you if that is the letter you refer to? *A* It is.

Q How long did the Borough of Groton continue to receive electric energy from the Connecticut Light and Power Company [*621*] under the terms of that letter? *A* We are still continuing to receive energy under the terms of that letter.

Q How was the contract of March 31, 1930, and as modified by the agreement of June 5, 1935, terminated? *A* By agreement by either party on one year's notification.

Q That is to say, that is the means by which it could have been terminated? *A* It could have been.

Q Now, how was it terminated? *A* It was terminated by the Connecticut Light and Power Company advising the Borough of Groton, Water and Electric Department, that they did not wish to —I will go back. I will have to go back and refer to correspondence.

Q I show you a letter dated September 27, 1939, on the letterhead of the Connecticut Light and Power Company, signed by A. V. S. Lindsley, Vice-President, attached to the stipulation, and ask you if that is the letter to which you refer? *A* Yes.

Q It is? *A* It is.

Q After receiving that notice, did you write a letter to the Connecticut Light & Power Company, or some employee or official of that company, in which you spoke of the abruptness of that letter of cancellation, on or about the 22nd of [*622*] November, 1939? *A* I don't appear to have that letter in these files here.

Q Do you have any independent recollection of writing such a

letter to the Connecticut Light and Power Company? *A* I remember a conversation to that effect.

Q Who was that conversation with?

Mr. Branch: I think I will object at this point. I don't see what possible bearing on any issue in this case a conversation had, even if the contracts themselves, or the terminations are material, and it certainly hasn't appeared yet—all that would be material would be contractual relations, and any conversations of that nature, unless they constituted an agreement, obviously would be inadmissible.

Trial Examiner: Will counsel state the purpose for which he desires to admit this conversation.

Mr. Wahrenbrock: The purpose will appear that the Connecticut Light and Power Company terminated this contractual relationship as a part of its scheme to avoid jurisdiction of the Federal Power Commission.

Trial Examiner: I think with that in view it is admissible. If the purpose is not sustained and the relevancy not shown later, counsel may move to strike the testimony.

Mr. Branch: Will you note my exception?

Trial Examiner: Your exception is noted.

Mr. Branch: It seems to me—I want to make it clear [623] I am not acceding to the proposition that even if any relationship with the issues in this case were the purpose, that that would be at all material.

Mr. Wahrenbrock: I will ask another question of Mr. Tiffany.

By Mr. Wahrenbrock. *Q* Had you had any intimation before you received this notice of cancellation— *A* No.

Mr. Branch: Wait. Just a minute, please.

By Mr. Wahrenbrock: *Q* Had you had any intimation of the intention of the company to terminate the contract prior to this notice of cancellation?

Mr. Branch: I object to it as immaterial and irrelevant. The contracts provide for a year's notice, and a year's notice apparently was given.

Trial Examiner: I don't see the materiality of the question. Counsel may state the reason why he thinks it is.

Mr. Wahrenbrock: I have subpoenaed this witness, Mr. Examiner, and while I have met him before and discussed some of the physical arrangements, and while he has furnished some of the correspondence to the Federal Power Commission, I have not discussed his testimony. I think it is obvious that any man called upon to testify to the details of transactions some months or years past, must have his recollection refreshed, [*624*] and I have to take a few details before I can establish the more pertinent parts of this testimony. I think it will become obvious if we may proceed without too much delay. The more interruptions there are, the more it becomes necessary to ask additional questions.

Trial Examiner: You may proceed with the answer to this question. The exception will be noted.

The Witness: I can't give a complete answer yes or no.

By Mr. Wahrenbrock: *Q* Will you answer in so far as you can?

Mr. Branch: May it be stipulated that my objection goes to the entire line of inquiry as to conversations or lack of conversations, so that I won't have to keep interrupting Mr. Tiffany.

Trial Examiner: You may. Your exception is noted.

By Mr. Wahrenbrock: *Q* Had you had any previous intimation of the company's intentions to terminate this contract, or to require you to make any other arrangements? *A* No.

Q Did you seek an explanation of the reason for the company's action?

Mr. Branch: Same objection.

Trial Examiner: The objection is overruled.

The Witness: The reason was submitted prior to the [*625*] termination.

By Mr. Wahrenbrock: *Q* They informed you of their reasons for that? *A* No.

Q I don't understand what you mean. *A* We had endeavored for many months prior to the termination of this one year clause

to negotiate a new contract, and we received at no time no satisfactory answer to our pleas.

Q After you had received a notice of termination of the contract, did you have any meetings with the representatives of the company with respect to the termination? *A* I believe so.

* * * * * * [629]

Q Mr. Tiffany, after you received the notice of termination of the contract, did you have a conversation with representatives of the Company, in which they explained to you their reasons for their action in giving you the notice? *A* Yes, sir.

Q Did representatives of the Company attend a meeting of the Board of Commissioners in Groton on or about the 13th [*630*] of December of that year?

* * * * * *

A Yes.

Q You said "Yes"? *A* Yes.

* * * * * * [*631*]

Q I call your attention to the letter of June 14th, 1940, to which you have previously referred, and which is attached to the Stipulation, and particularly to the second sentence of that letter which reads—this is a letter addressed to you from the Connecticut Light and Power Company and signed for the company by A. V. S. Lindsley, Vice President:

> "When the Borough is in a position to contract for a supply of electric power for resale and ultimate use entirely within the chartered territory of the Borough of Groton, we will be glad to enter into a new agreement to furnish the electrical requirements, under the conditions which we discussed and considered mutually agreeable on June 11th, 1940. They are substantially as follows":—

Now, referring to that, can you say whether in these conversations which you have had and in the conversations which you had on December 13th, with the representatives of the Company, they explained to you their position in that connection?

* * * * * * [632]

The Witness: Yes.

By Mr. Wahrenbrock: *Q* What was that explanation? *A* That explanation was that we were exceeding our charter rights in furnishing energy outside of the State, and they could not negotiate another contract with the Borough of Groton until we discontinued serving out of the State firms, for instance, Fishers Island Farms.

[633] *Q* Who made that explanation to you? *A* Mr. Lindsley.

Q Mr. Lindsley. Mr. A. V. S. Lindsley? *A* Yes, sir.

Q Was Mr. Larabee present? *A* I believe he was present at that time.

Q Was this on the 13th of December? *A* I cannot definitely say without referring to further records.

Q Was the occasion prior to a meeting of the Board? *A* Yes.

Q In the evening? *A* Yes.

Q Did they explain to you why it was a matter of interest to them that you not sell to the Fishers Island Farms? *A* No.

* * * * * *

Q Did they explain to you why they had not raised the point before? [634] *A* No.

Q Did you ask them? *A* I had asked them for some little time why we could not have a new contract upon the termination of the old contract.

* * * * * *

Q Had the company ever raised any objection to your sale to Fishers Island? *A* No.

Mr. Branch: I object.

Trial Examiner: Objection overruled.

By Mr. Wahrenbrock: *Q* Will you answer? *A* I did answer —No.

Q They had never before made any objection to your resale of electric energy to Fishers Island? *A* No.

Q What else was said about their reasons for giving the cancellation notice?

[635] Mr. Branch: I understand my objection goes to all of this?

Trial Examiner: Your objection stands. I will have to see how far the answer goes.

The Witness: It was suggested by the Connecticut Light & Power Company that they did not want to supply the Borough of Groton, having knowledge that the chartered territory of the Borough of Groton did not include Fishers Island.

By Mr. Wahrenbrock: *Q* Did they tell you that that provision of the charter had just recently come to their attention? *A* No.

Q Did they refer to any legal advice that they had received on that point? *A* Yes.

Q Will you explain? *A* They referred to the opinion of the firm of Day, Berry & Howard, I am quite sure, whose opinion they either read or gave to me.

Q Have you a copy of that? *A* No.

Q Did they indicate to you that you would not receive any electric energy after the expiration of the year's notice? *A* No.

Q What did they say about your future supply of electric [636] energy? *A* They submitted a letter stating—a letter which is now in evidence in the court, June 14th—

Trial Examiner: (Interrupting) Will you speak a little louder?

The Witness: They submitted a letter which is now in evidence, stating the terms under which we could continue to purchase electric power, and also a letter which suggests the form of the new type of contract.

By Mr. Wahrenbrock: *Q* That was done on June 14th, 1940? *A* I have that second letter here.

Q I show you the letter of June 14th, 1940, attached to the Stipulation. Is that the letter to which you refer? *A* (Examining letter). Yes.

Q Prior to the receipt of that letter, and particularly referring to the conversation you had with Mr. Lindsley and Mr. Larabee, if it was Mr. Larabee, on the 13th of December, did they indicate to

you then what their course of action would be when the one year period had expired?

* * * * * * [637]

Trial Examiner: Do you understand the question?

The Witness: Yes. My answer is "Yes".

* * * * * * [639]

By Mr. Wahrenbrock: *Q* What did they tell you?

* * * * * *

The Witness: They told us, after we had discontinued supplying power to Fishers Island Farms, they would negotiate a new contract, having in mind especially new labor costs, value of current, and/or other unforeseen factors.

By Mr. Wahrenbrock: *Q* Did any representative of the company at that time and in that connection mention to you the proceedings of the Federal Power Commission against the Hartford Electric Light Company? *A* No.

Q Did you have any conversations at any other times with representatives of the company at which they gave you any more explanation of their reasons for desiring that you discontinue [640] selling to Fishers Island? *A* Yes.

* * * * * *

The Witness: The desire of the Connecticut Light and Power Company was that there would be no physical connection between our lines and Fishers Island.

By Mr. Wahrenbrock: *Q* Will you tell us when and where you had some of these conversations? *A* As far back as more than a year prior to the one year's termination of our contract. At that time, my department corresponded to considerable length with the Connecticut Light and Power Company in an effort to have a contract renewal, and we have not as yet any contract with the Connecticut Light and Power Company.

* * * * * * [642]

Q Can you describe the facilities by which the Connecticut

Light and Power Company delivers electric energy to the Borough of Groton? *A* At what time?

Q I would like to get a description covering the whole period of time since August 26th, 1935. If there have been changes during the last six years, perhaps the easiest way would be to begin at the more recent times and go back.

Mr. Branch: Excuse me. I understood what you just said, but I don't understand the question, if it is related to making a question. May I either have it read or will you [643] restate it?

Trial Examiner: Read the question, Mr. Reporter, for the benefit of counsel.

Mr. Branch: I understood what he said this last time, but there was no question there, that is my difficulty.

(The question was read.)

Trial Examiner: I think that covers the whole situation.

The Witness: As of today, the Connecticut Light and Power Company supplies us power to the high voltage terminals of a substation located near the Borough of Groton.

By Mr. Wahrenbrock: *Q* What is the name of that substation? *A* Commonly known as Trails Corners Station.

Q You say at the high voltage terminals of a transmission line? *A* Not as of today. High voltage terminals of a substation.

Q And where do they obtain the electric energy and how do they bring it to that point? *A* By a transmission line, whose nearest generating station is at Montville, Connecticut.

Q What is the voltage of that line? *A* 33,000 volts.

Q Is it a two-circuit or single circuit line? *A* Two-circuit.

[644] *Q* Steel tower? *A* Wooden construction.

Q What does their sub-station consist of? *A* Consists of one 1,000 KVA three-phase 33,000 volt, 60 cycle primary, to 2,300 volt secondary three-phase.

Q Is the electric energy delivered to you at 2,300 volts? *A* I have not finished the answer to your other question.

Q Excuse me. *A* There are also two 500 KVA transformers of the same characteristics.

Q At what voltage is the electric energy delivered to you? *A* At the present time, due to construction, it is delivered to us at 2,300 volts by our equipment.

Mr. Wahrenbrock: May I have that answer repeated?

(The answer is repeated.)

The Witness: At the present time, the equipment of the Connecticut Light and Power Company is in the process of overhauling and putting back on the line—the metering equipment.

Mr. Wahrenbrock: May I have the answer read now?

(The record is read.)

By Mr. Wahrenbrock: [645] *Q* Is that correct? *A* Yes.

Q Will you explain? I don't fully understand it. *A* I will be glad to. The Borough of Groton is at the present time erecting a sub-station to replace the sub-station now owned by the Connecticut Light and Power Company, and during the course of this construction, the metering equipment which we formerly used is now out of service and we are using secondary metering equipment of the Borough of Groton.

Q The electric energy which the Borough is now purchasing is being metered on the low tension side of the transformers? *A* That is right.

Q Formerly it was on the high-tension side? *A* That is right.

Q Will you describe the facilities for delivery of electric energy to the Borough prior to the last change? *A* From the two lines coming from Montville to our substations, there were two additional lines metered at the Trails Corners Substation, and going in a southerly and easterly direction to another substation at Groton Long Point, where it was further reduced in voltage to another substation, to transmit to Groton Long Point and to distribute to Fishers Island.

[646] *Q* At that time, that is, immediately prior to this last change, when you were receiving electric energy at Trails Corner, and at Groton Long Point high tension sub-station, did the Connecticut Light and Power Company own the transformers at the Trails Corner Substation? *A* At that time it did.

Q Did they own the transformers at Groton Long Point High-tension Substation? *A* They were being purchased by the Borough of Groton on a monthly payment basis. We had the title to the transformers.

Q And had the Connecticut Light and Power Company previously owned the transformers at the Groton Long Point High Tension Substation? *A* Yes.

Q When did you obtain title from them to those transformers? *A* June 15th, 1937.

Q Had the Connecticut Light and Power Company owned those transformers at all times prior to that date, back to August 26th, 1935? *A* They had owned them at all times that they were there. I don't recall the date.

Q Were those transformers installed prior to 1935? *A* I don't think so. I think in negotiating the new contract with the Fishers Island Farms, in 1935, new equipment [*647*] was required. At least as to the transformers that you speak of now.

Q Were these transformers in the Groton Long Point High Tension Substation installed at the time of the negotiation of a new contract for the sale of electric energy to Fishers Island? *A* I believe so.

Q I show you an agreement attached to the Stipulation and dated the 15th day of June, 1935, and signed by the Borough of Groton Utility Commissioners and the Fishers Island Farms, Inc. and ask you if that is the agreement to which you referred? *A* Yes.

Q Is that agreement—

Mr. Wahrenbrock: I withdraw that.

Q And it was at the time of the negotiation of that agreement that the step-down transformers in the Groton Long Point High Tension Substation were installed? *A* I believe so.

Q Who installed those transformers?

Mr. Branch: What is "that agreement"? You withdrew some question, and there has not been anything identified as to that, and I think it ought to be more definite.

Mr. Wahrenbrock: The agreement of June 15th, 1935, between the Borough of Groton and Fishers Island Farms, Inc., to which [648] I previously referred.

Mr. Branch: Will you show me a copy of that?

Mr. Wahrenbrock: It is attached to the Stipulation.

Mr. Branch: Have you it right there?

Mr. Wahrenbrock: Yes.

Mr. Branch: Never mind. I have it.

Mr. Wahrenbrock: Now, may my question be re-read?

The Witness: I remember the question.

Mr. Wahrenbrock: I don't; I am sorry. Will the reporter read it to me?

Trial Examiner: The reporter will read the question for the benefit of counsel.

(The question is read.)

By Mr. Wahrenbrock: *Q* Will you answer that question now, please? *A* Connecticut Light and Power Company.

Q What was the purpose of installing those transformers? *A* Increased load to Fishers Island and Groton Long Point.

Q What is that? *A* Increased requirements of Fishers Island Farms and Groton Long Point.

Trial Examiner: Do I understand you to mean to meet the increased requirements?

The Witness: That is right.

[649] By Mr. Wahrenbrock: *Q* That is, those transformers were installed to meet the load requirements which would follow from the increased demand on Fishers Island. *A* And Groton Long Point.

Q And Groton Long Point? *A* Yes.

Q I wish to return now for a moment in my questions to the Trails Corner Substation, and ask you who owned the step-down transformers there prior to the last change, that is, the present temporary conditions under which you are operating? *A* Connecticut Light and Power Company.

Q Will you describe those transformers, please? *A* They con-

sisted of three transformers, one 1,000 KVA and two 500 KVA three-phase transformers, from 33,000 to 2,300 volts, with taps.

Q How long had they been in position? *A* More than fifteen years—I will qualify that. Two of them were there more than fifteen years and one was there before I came, but it was moved to Groton Long Point and again returned to that Trails Corner Substation.

Q Did the Connecticut Light and Power Company own any other facilities in that substation? *A* At one time, yes.

[*650*] *Q* When was that? *A* I might answer the question in a way that I don't think has been clarified. There were two parts of that substation. After the energy was reduced to 2,300 volts then it went to a small building for distribution. The other equipment of the Connecticut Light and Power Company consisted of the metering equipment and lighting arresters and the structure itself.

Q And the Connecticut Light and Power Company owned the metering equipment and the lightning arresters at all times, after August 26th, 1935, down to the last date that you spoke of? *A* Yes.

Q Will you describe the transformers at the Groton Long Point High Tension Substation which were installed approximately at the time the June 15th, 1935 agreement was entered into?

Mr. Branch: I object. I don't know whether this has significance or not, but there is no evidence that the Groton Long Point substation is a High Tension substation, if that is the way it was designated. May I have the question read?

Trial Examiner: Read the question.

(The question is read.)

Mr. Branch: I don't know the significance of that, but I think there is no testimony designating it as a high tension [*651*] substation.

Trial Examiner: I think the question might be modified to meet your objection by striking out the words "high tension", unless there is some reason for it?

Mr. Wahrenbrock: There is, Mr. Examiner. I will be very

glad to clear it up, if I may interrupt then, with a few other questions.

[652] *Q* You previously referred to a sub-station in Groton, Long Point, at which the electric energy is stepped down—at which the voltage is stepped down from 33,000 volts, have you not? *A* Yes.

Q Is there another sub-station in Groton Long Point? *A* Yes.

Q How do you distinguish those two sub-stations, the one from the other, by name? *A* The brick sub-station.

Q And in the voltage stepped down from a nominal voltage of 6900, stepped down to a nominal voltage of—I withdraw that question. Will you describe the brick sub-station? *A* The brick sub-station contains 6900 volt switching equipment, and also 2300 volt switching equipment, together with meters, and in 1935—that is the date we are talking of?

Q Yes. *A* (Continuing)—contained voltage regulators.

Q How do you designate the other sub-station in Groton Long Point? *A* The Connecticut Light and Power Company, high voltage sub-station.

Q The Connecticut Light and Power, high voltage sub-station? *A* Yes.

[653] *Q* Will you describe the transformers in the Connecticut Light and Power Company, high voltage sub-station at Groton Long Point, which were installed about the time of the June 15, 1935, contract?

Mr. Branch: Excuse me. I again must make the same objection as to the use of "high tension" which I think was used.

Trial Examiner: I think the words "high voltage" have been shown to be descriptive of the station, and in that respect I think it is permissible. The objection is overruled.

By Mr. Wahrenbrock; *Q* Will you answer? *A* This station consists of two incoming lines of 33,000 volts.

Q When you say it consists, you are speaking of it as of the time of the installation of the transformers in 1935? *A* To the best of my knowledge and belief.

Q Will you continue? *A* There is a combination of wood and steel framework to use as buf supports, and one section as a line section, approximately 200 feet, before the lines get to the sub-station; there are two gang operated, high voltage switches, one for either circuit—one for each circuit, rather. There was also in 1935 a 7500 volt oil switch, manually operated, on the 6900 volt side of the three single phase transformers which were in the station. These transformers were of 400 KVA [654] 33,000 to 6900, with per cent taps.

Q The condition you have just described was—that was as of the time of the negotiation of the June 15, 1935 contract, is that right? *A* I believe that is the correct date.

Q Now, what changes were subsequently made in that sub-station? *A* It was subsequently abandoned.

Q Was that the first change that was made? *A* Except minor repairs, yes.

Q When was the sub-station—

Mr. Branch: Excuse me. May I have that last answer read?

(Whereupon the last answer as above recorded, was read by the reporter.)

By Mr. Wahrenbrock: *Q* When was the sub-station abandoned? *A* In February, 1941.

Q How long did the Connecticut Light and Power Company remain the owner of the sub-station? *A* Approximately 1937, at which time—excuse me. Do you wish me to continue?

Q Yes, if you will, please.

Mr. Branch: I think the best evidence is the instrument which effected the sale—the deed, or the bill of sale, or whatever it was—instead of asking the witness to give his [655] recollection. I think we ought to get it from the instrument itself.

Mr. Wahrenbrock: I have no objection.

Trial Examiner: The best evidence would be as suggested. Would it be possible to get the instrument and put it in evidence.

Mr. Wahrenbrock: I have no objection to the respondent furnishing the instrument if they have it. I don't have it.

Mr. Examiner, my present question only goes to the approximate time.

Mr. Branch: Why not have it right instead of asking the witness to try to remember something that happened years ago? In the stipulation, Mr. Wahrenbrock, I think is an instrument—

Mr. Wahrenbrock: Thank you for the suggestion.

Mr. Branch: The stipulation contains that instrument which states that the Borough is exercising its right to purchase that, and that seems to be dated November 15, 1935.

Mr. Wahrenbrock: Thank you for calling that to my attention.

By Mr. Wahrenbrock: *Q* Mr. Tiffany, I show you the memoranda of an agreement to which Mr. Branch has just referred to, agreed to and accepted the 15th day of November, 1935, and I ask you if by referring to that you are able to refresh your recollection as to the time—

[656] *A* (Interrupting) That is.

Q (Continuing)—as to the time when the Borough of Groton acquired the Connecticut Light and Power Company sub-station in Groton Long Point. *A* That is right.

Q What would you say then is the time when the Borough of Groton did acquire that sub-station? *A* The 15th day of November, 1935.

Q Did the Connecticut Light and Power Company retain the ownership of the 33,000 volt line between the Trails Corner sub-station and the so-called Connecticut Light and Power Company sub-station at Groton Long Point? *A* They did for some little time.

Q How long did they retain that? *A* Until late in 1940.

Mr. Branch: May I state for the record that I have here a copy of a bill of sale from the Connecticut Light and Power Company to the Borough of Groton which transfers and conveys poles, wires, fixtures, of every kind, located in the Town of Groton, consisting of electric lines, and so forth, extending from Trails Corner sub-station to Groton Long Point sub-station—Trails Corner sub-station of the vendor, the Connecticut Light and Power Company,

to the Groton Long Point, the vendee, and that is dated July 19, 1940. Will you accept that date?

[657] Mr. Wahrenbrock: Thank you for that.

By Mr. Wahrenbrock: *Q* Do you recognize that date? *A* Except I was not authorized to accept it as of that date. It was accepted in August by the Board of Commissioners.

Q Can you fix that date? *A* About August, 1940.

Q Thank you. Except for the present situation, has the energy which has been delivered to the Borough of Groton always been metered at 33,000 volts at Trails Corner sub-station? *A* From 1935?

Q Yes. *A* Yes.

Q And those meters have always been owned by the Connecticut Light and Power Company? *A* Yes.

* * * * * *

Q I wish to refer back to what you said about the termination of the contract for sale of power to the Borough of Groton by the Connecticut Light and Power Company, and ask you if the failure to execute a new contract has given rise to any difficulty in your operation of your department? *A* Yes.

* * * * * *

Q Will you describe what those difficulties have been?

* * * * * *

The Witness: We primarily lost a valuable customer. We [660] had upon our hands electrical equipment which was of no further value to us except junk value, and we have no facilities now to supply customers who have since developed.

* * * * * *

By Mr. Wahrenbrock: *Q* To what customer did you refer? *A* Fishers Island Farms.

Q Did you lose any other customers by reason of the failure of the Connecticut Light and Power Company to negotiate a contract? *A* Yes.

Q What was that customer?

* * * * * *

The Witness: The Electric Boat Company.

By Mr. Wahrenbrock: *Q* Is the Electric Boat Company in your territory? *A* Yes, sir.

[*661*] *Q* Will you explain—

Trial Examiner: Will you define the territory a little closer?

Mr. Wahrenbrock: I would be glad to have the—

Trial Examiner: Do you refer to the two townships in that respect?

By Mr. Wahrenbrock: *Q* Will you explain where the Electric Boat Company is with reference to your territory? *A* All of our chartered territory is within the Town of Groton, and the Electric Boat Company is in the town of Groton and also in the Borough of Groton.

Trial Examiner: That clarifies the point. I think you referred to the two points.

By Mr. Wahrenbrock: *Q* Is the Electric Boat Company being served by somebody? *A* It is.

Q By whom? *A* The Connecticut Light and Power Company.

Q In your territory? *A* Yes.

Q Is the Connecticut Light and Power Company serving anybody else in your territory? *A* No, except us.

Q Well, now, how is this due to the failure of the [*662*] Connecticut Light and Power Company to enter into a further contract with you? *A* Because we had no contract for resale. We had no contract for purchase, consequently we could offer no contract for resale.

Q That is, you could not enter into a contract to sell to the Electric Boat Company as long as you did not have a contract for purchase? *A* That is right.

* * * * * * [*668*]

By Mr. Wahrenbrock: *Q* Are you familiar with the submarine cables or the location of the submarine cables by which Fishers

Island Farms, Inc. took the electric energy which they purchased from you, at Fishers Island? *A* Yes.

Q I show you the map of Fishers Island, New York, showing the area served by the Fishers Island Farms Inc., which is a part of Exhibit 16 for Identification, and I ask you if by looking at that map and by comparing it with any data of your own you [669] are able to say whether the submarine cables which are indicated on that map that I show you are the submarine cables by which Fishers Island Farms, Inc. took the electric energy which they purchased from you, to Fishers Island.

Mr. Wahrenbrock: May the record show that the witness is comparing the map to which I have referred with maps of his own.

Trial Examiner: It will be so noted.

The Witness: Yes.

By Mr. Wahrenbrock: *Q* The map I have shown you does correctly represent submarine cables by which Fishers Island Farms, Inc. took the electric energy to Fishers Island? *A* Yes.

Q I notice on this map that there are three lines shown from Groton Long Point towards the Sound, two approximately parallel with the one apparently branching off at an angle. Will you explain about the line which is marked "abandoned, 1935", or do you have knowledge of that? *A* I do.

Q Will you explain it? *A* That line was the original cable and the only cable to Fishers Island at the time of the original contract with Fishers Island, in 1929, I believe. That cable was damaged several times prior to its replacement. That cable was operated [670] at 2,300 volts primarily, subsequently operated at 6,600 volts. On account of the many failures in the cable it was abandoned and a new cable and substitute connections were installed.

Q Approximately when was the new cable installed? *A* 1935.

Q In 1935? *A* Yes.

Q And the new cable which was installed in 1935 is the cable which is approximately parallel to that first cable? *A* Yes.

Q When was the first cable which is shown at a considerable

angle to those two installed? *A* I would have to refer to further records.

Q I show you the third sheet in Exhibit 17 and direct your attention to the date shown on that exhibit which is shown by a stamp, "Permit Drawing 253/A/5/8/22," and the line across Fishers Island Sound, and I ask you if you recognize that as referring to the first cable abandoned in 1935, to which you have referred?

Mr. Wahrenbrock: May the record show that the witness is again comparing the map I show him with maps of his own?

Trial Examiner: It will be so noted.

The Witness: Yes.

Mr. Wahrenbrock: I now turn to the 7th sheet of Exhibit 17 which is entitled "Proposed Submarine Cable across Fishers [*671*] Island Sound, from Groton Long Point Connecticut to Chocomount Cove, Fishers Island, application by Fishers Island Farms, Inc." and ask you if the line across Fishers Island Sound shows the submarine cable which was subsequently installed at an angle to the 1922 and the 1935 cables, to which you have referred? *A* That is the Chocomount cable which also I have my own identification of.

Q And I turn to the next sheet in the same exhibit and ask you what cable is shown by that map? *A* That is the same cable.

Q That is the same Chocomount Cove cable? *A* Yes.

Q I refer you to the part of Exhibit 17 which is the War Department permit under date of March 19th, 1931, and ask you whether that refreshes your recollection as to the date or the approximate date of the construction of the Chocomount Cove Submarine cable? *A* I know it was there at that time.

Q That is, beginning in 1931 or earlier? *A* It may have been earlier.

Q Then do I understand that from August 26th, 1935, on there were two submarine cables in operation from Groton Long Point to Fishers Island? *A* Yes.

[*672*] Mr. Branch: Up to what time?

By Mr. Wahrenbrock: *Q* How long did that continue in operation? *A* They discontinued the cable operation on March 1st, 1941—pardon me—1940.

Q 1940? *A* Yes.

Q Will you explain how reliable electric service to Fishers Island by means of these submarine cables was? *A* The reliability of service was considered normal at the time that the Borough of Groton and the Fishers Island Farms worked together for repairs.

Q Are you acquainted with the location of the principal electric facilities on Fishers Island up to the time of the termination of service by you to Fishers Island? *A* Yes.

Q I show you the map which is part of Exhibit 16 for Identification, and ask you if that appears to you to be a correct representation according to its terms, of the facilities on Fishers Island? *A* Yes, sir.

Mr. Branch: I object. I do not see what possible bearing the facilities on Fishers Island have on this case.

Trial Examiner: The objection is overruled.

By Mr. Wahrenbrock: [673] *Q* Do you know how the Fisher's Island Electric Corporation is now obtaining electric energy to supply its needs on Fishers Island? *A* Not from personal observation.

Q Do you have knowledge that satisfies you as to its reliability as to how they are obtaining their supply of electric energy? *A* Yes.

* * * * * * [676]

By Mr. Wahrenbrock: *Q* Mr. Tiffany, I am going to show you —I show you the annual report of the Borough of Groton, Water & Electric Department, on FPC Form No. 96, to the Federal Power Commission, for the year ended December 31, 1939, and to Schedule 530 [677] thereof—

Trial Examiner: Has counsel had an opportunity to see a copy of it?

Mr. Wahrenbrock: On page 508—I show it to counsel. Hav-

ing shown it to counsel, to their edification, I now show it to the witness, and ask him—

By Mr. Wahrenbrock: *Q* Preliminary to that, I show him the last page and ask him if this report was signed by him? *A* Yes.

Q I turn now to the page to which I referred, and ask you why no report was made on that page of the electric energy sold to Fishers Island Farms, Incorporated. I am not sure whether by that time Fishers Island Farms, Incorporated, had sold its—transferred its facilities—I am not sure whether it transferred its facilities to the Fishers Island Electric Company or not, but it was one of those corporations, but why were not your electric sales to one or the other of those two corporations not shown there?

* * * * * * [*680*]

Trial Examiner: I would suggest that you withdraw that question, and ask the question first as to whether it actually is shown in the record. I believe your question was as to why. I suggest that you withdraw that and ask the other question first.

Mr. Wahrenbrock: I would be glad to.

By Mr. Wahrenbrock: *Q* Does that schedule show your sales to the Borough of Groton—from the Borough of Groton to Fishers Island? *A* No.

* * * * * * [*683*]

Q Mr. Tiffany, did the officials of the Connecticut Light [*684*] and Power Company have knowledge at all times since 1935 up to the beginning of 1941, that the Borough of Groton was selling electric energy to Fishers Island?

Mr. Branch: I will admit that in order to shorten it.

* * * * * *

The Witness: I was informed by the legal department of the Connecticut Light and Power Company that we were serving power beyond our charter limits. Then I know it. It was between 1935 and today.

* * * * * * [*685*]

By Mr. Wahrenbrock: *Q* I show you the last photostat attached

to Exhibit 16, and ask you if you recognize the letter of which that is a copy?

Trial Examiner: That is Exhibit 16 for Identification.

Mr. Wahrenbrock: That is the last photostat attached to the stipulation.

Trial Examiner: You said Exhibit 16.

Mr. Wahrenbrock: I am sorry. I misspoke myself.

By Mr. Wahrenbrock: *Q* This is a copy of the letter that you wrote to the Federal Power Commission on October 17th, 1940? *A* Yes.

Q And are the statements therein made true?

* * * * * *

The Witness: I identify it, yes.

[*686*] By Mr. Wahrenbrock: *Q* And the question was, are the statements which are made therein true? *A* Yes.

* * * * * * [*704*]

(Photostat referred to was marked Exhibit Number 18 for Identification.)

* * * * * *

Q And that is a photostat of the piece of paper which you have in your possession and before you? *A* Yes.

Q And the paper which you have before you, is that a [*705*] carbon copy of the original which was sent to the Federal Power Commission? *A* Yes.

* * * * * *

By Mr. Wahrenbrock: *Q* Mr. Tiffany, can you explain how a signed carbon copy of this letter which you sent to the Federal Power Commission got into the possession of the respondents? *A* Yes.

Q Will you do so, please? *A* I gave it to the counsel for the respondent.

Q You gave the photostats to the counsel for the respondent? *A* No, the copy.

Q The signed carbon copy? *A* The initialed carbon copy.

Q The initialed carbon copy? *A* Yes, sir.

Q When was that? *A* Within the past month.

Q Who requested you for that? *A* Mr.—I cannot recall his name.

[*706*] Mr. Branch: Mr. O. D. Smith.

The Witness: Mr. Smith, yes.

By Mr. Wahrenbrock: *Q* How did he happen to know of the existence of the letter? *A* He inquired of my office if I had any furher correspondence pertinent to this case.

* * * * * *

Q Now, Mr. Tiffany, yesterday, I understood you to testify that prior to December 13, 1939, you had had conversations with Mr. Lindsley or Mr. Larabee or possibly both of [*707*] them, in which they discussed with you the Company's reason for terminating the contract between the Company and the Borough. I wish to ask you now whether after that time and during 1940, you had any conversations with Mr. Larabee or Mr. Lindsley or other representatives of the Company in which you discussed with them their reasons for terminating the contract?

* * * * * *

The Witness: Yes, sir.

* * * * * *

By Mr. Wahrenbrock: *Q* Will you state what was said? *A* There were many conversations and many topics, sir. I [*708*] cannot recall all of those topics.

Q Can you recall what they said as to the Company's reasons for insisting that you cease to serve Fishers Island before they would give you a further contract? *A* Yes, I can.

Q Will you tell that? *A* The reason as indicated and also as given to me was that the Borough of Groton did not have charter rights to serve Fishers Island Farms with electricity and they did not desire to be accessory to the fact that they were to be served.

Q I did not understand the last. *A* They did not desire to be

accessory to the fact that electricity would be sold to Fishers Island Farms through the facilities of the Borough of Groton.

Q Did they tell you why? *A* Not at that time.

Q Did they tell you why at any time? *A* They had expressed to me in oral conversations their desire not to serve any electricity or electric customers outside of the territorial limits of the State of Connecticut.

* * * * * * [709]

Q Did they tell you why they did not want to be accessory to the fact of your resale of electric energy to a customer who took it outside of the State? *A* Yes, but I did not understand the answer clearly.

Q What was the answer, so far as you recall it. *A* Well, it was that they did not desire to be under the ruling of the SEC.

* * * * * *

Q The Borough is no longer selling electric energy to Fishers Island, is that true? *A* That is true. They are no longer selling it.

Q When did the Borough make its last delivery of electric energy to Fishers Island? *A* In February, 1940.

Q Was it on February 8th, 1940? *A* Actually, the physical disconnection was February 28th, the physical disconnection.

[710] *Q* On February 28th, the facilities were physically disconnected, so that thereafter the Borough could no longer deliver electric energy to Fishers Island? *A* Yes.

Q Had the Borough delivered electric energy to Fishers Island up to that date? *A* Yes—with qualification. We had designed connections so that they could in testing the operation of the equipment, give immediate power.

Q You were connected so that you could supply them with electric energy. Was any electric energy actually supplied them after February 8th or 9th? *A* I am sure there was not.

Q You have been saying February of 1940. Was it this year or last year? *A* This year.

Q It was 1941 instead of 1940? *A* Yes.

Q For clarity then, the Borough actually delivered quantities

of electric energy to Fishers Island up to February 8th or 9th, 1941 and remained connected up to February 28th, 1941? *A* Yes.

Q After you disconnected from Fishers Island and ceased to serve them with electric energy, did the Company [*711*] negotiate or enter into an agreement with the Borough to supply them with electric energy? *A* Not a new agreement.

Q No new agreement? *A* No new agreement.

Q You are now paying for electric energy on the terms outlined in the letter of June 14th, 1940, are you? *A* Yes, sir.

Q But you have no contract binding them to deliver the electric energy to you? *A* Nothing, except as mentioned in the letter.

* * * * * * [*712*]

Q What has been the effect on your ability to negotiate contracts for the sale of electric energy in not having a contract with the Connecticut Light and Power Company? *A* We have been unable to sell prospective customers.

Q You have been unable to sell to prospective customers? *A* Yes.

Q Was the purchase of the 33,000 volt line from the Connecticut Light and Power Company by the Borough, and I refer to the line between the Trails Corner sub-station and the Groton Long Point high voltage sub-station—was that sale ratified by proper action of the Borough or by action of the Borough on September 3, 1940?

Trial Examiner: I think the question might be worded what ratification was made. I don't believe the witness is qualified to say what is proper.

Mr. Wahrenbrock: I meant to omit the word "proper", if your Honor please.

The Witness: May I please have the question again?

By Mr. Wahrenbrock: *Q* Yes. The question is whether that purchase was ratified by the adoption of an ordinance? *A* It was

ratified but not by adoption of an ordinance—yes, it was adopted by an ordinance.

Q On what date was that ordinance adopted? [*713*] *A* I have not that information.

Q Are you able to say whether it was on October 3, 1940? *A* About that time, yes.

Q About that time? *A* About that time.

Q Since the Borough of Groton has ceased to supply electric energy to Fishers Island, has any representative of the War Department approached you about the possibility of restoring electric service to the Island?

Mr. Branch: I object. It seems to me that is entirely immaterial. Conversations between third parties, I think, is going pretty far. There might be conversations in regard to any of these matters with the respondent which might be material, but conversations between this witness and the representative of the War Department, it seems to me is inadmissible as being hearsay and as being irrelevant, and having no bearing on the issues of the case.

Trial Examiner: We are ruling out hearsay. Can counsel state any reason why the hearsay rule should be waived?

Mr. Wahrenbrock: Mr. Examiner, I think it is just a matter of common observation. We know in these times that when the War Department wants to get something done and is faced with a difficult situation, it goes to a man and talks to him and hopes to get results. I propose to ask this witness, rather than bring an army officer here to testify. He has [*714*] more important things to do. This man participated in the conversation, if there was a conversation, and I am asking if there was.

Trial Examiner: I think in view of the circumstances, and the normal objection at the present time to subpoenaing an army officer away from his other duties, we will permit the question to be answered.

By Mr. Wahrenbrock: *Q* Will you answer the question now,

Mr. Tiffany? *A* I can't answer the question correctly as to date, but there was the colonel of the army, and a gentleman with him from the army district in Boston, in my office asking the Borough of Groton to supply more power to Fishers Island.

Q In asking you for a description of the facilities of the Borough yesterday, I believe I omitted to ask you to state how the Groton Long Point high voltage sub-station was connected to the Groton Long Point brick sub-station.

* * * * * * [*715*]

A There was a 6900 volt line from the sub-station, about half way between there and the brick sub-station. The remaining half was under ground cables, and there was also a duplicate line, all overhead, but it was never put in use from and to the station. It was an emergency line.

Q What was the voltage at which that line and underground cable was operated? *A* Between 6600 and 6900 volts.

* * * * * *

Cross Examination by Mr. BRANCH.

Q Mr. Tiffany, I would like to ask you a question. The [*716*] cable or—in the first place, of course, all of these facilities which you have described, with the exception of the cable, are in the State of Connecticut, are they not, Mr. Tiffany? *A* Yes.

Q And the cables always belong to a company which served customers on Fishers Island with electricity, did they not? *A* Yes.

* * * * * * [*719*]

By Mr. Branch: *Q* Now, the cables, as I understand it, were attached to your facilities at a point right on the shore, approximately in the place which I indicate here, were they not, Mr. Tiffany? (Indicating.) *A* They were approximately 400 feet back of this point here (indicating) in a little building right there (indicating on map).

Q But it is very near the shore? *A* Yes.

Q You call that the Brick Substation? *A* Yes.

Q Now, that substation was at all times owned by the Borough of Groton, was it not? *A* Yes.

Q And in that substation were also connections of yours which served customers in Groton on the mainland, were there not? *A* Yes.

Mr. Wahrenbrock: Mr. Examiner, respondent's counsel is pointing to a location in Groton Long Point rather than Groton, as I know the topography, but I may be mistaken.

[*720*] Mr. Branch: I don't know where the boundary lines are between the Boroughs, and I am not concerned about it, when I am speaking of Groton, because I am talking about the town of Groton now. It was—there is a town of Groton which is shown as such, on this map, isn't there?

The Witness: I answered that, that it was the town of Groton.

By Mr. Branch: *Q* And then, as I understand it, there ran from that substation a line to another substation which you called the Groton Long Point Substation? *A* That is right.

Q And that line operated at about 6,600 volts? *A* Yes.

Q And that line at all times was owned by the Borough of Groton, was it not? *A* Not at all times—pardon me, yes.

Q That line was how long,—about a mile? *A* Roughly a mile.

Q And I think you said that part of that line was carried overhead on poles and part was a cable underground, is that correct? *A* Yes, sir.

Q We are now at what I call the Groton Long Point substation, at the point indicated here (indicating on map) and [*721*] that substation, I think you said, transformed the energy from 33,000 volts to 6,600 volts?

Mr. Wahrenbrock: Mr. Examiner, there was no statement on the direct examination that the transformers transformed the energy. There may have been a change in the voltage—there

may have been testimony about a change in voltage by the transformers. There was no testimony as to a change in the energy by the transformers.

Mr. Branch: I am cross examining the witness and I think I have a right to ask him that question.

Mr. Wahrenbock: You assumed a statement that had not been made.

By Mr. Branch: *Q* Well, is it not true that at that point there were transformers which transformed the energy from 33,000 volts to 6,600 volts, Mr. Tiffany? *A* Yes.

Q There were several transformers there, were there not? *A* Three.

Q And those transformers were owned by the Borough of Groton, from some time in 1935, up to the present year, were they not? *A*. Yes, sir.

Q And all of the other equipment in that substation was owned by the Borough of Groton during those times, was it not? [*722*] *A* The Groton Long Point Substation, the high voltage substation?

Q Yes. *A* May I have that question again, please?

Mr. Wahrenbock: I am sorry, I did not hear the answer.

The Witness: I did not answer. I asked for the question again.

(The question is repeated.)

By Mr. Branch: *Q* That is, from 1935 up to the present year. *A* All but a portion of it.

Q What portion of it was not? *A* Just the lightning arresters.

Q The lightning arrester? *A* Arresters,—three.

Q Then going in this direction, which I take it is in a general northwesterly and a westerly direction (indicating) there was a double circuit line of 33,000 volts to Trails Corner, was there not? *A* Yes.

Q And that line, or those lines, were owned by the Borough

of Groton from some time last Summer, that is, 1940, up to this year, were they not? *A* Yes, some time in 1940.

Q And that line was a 33,000 volt—both of those cir- [723] cuits were 33,000 volts, were they not? *A* Yes.

Q Now, as I understand it, at Trails Corner there was a sub-station which was at all times owned by the Borough of Groton? *A* No, the substation building was at all times owned by the Borough of Groton. The substation contents were finally acquired by the Borough of Groton.

Q When was that acquired? *A* During the past fourteen years.

Q During the past fourteen years? *A* At various times.

Q At various times? *A* Yes.

Q But for many years the Borough of Groton has owned a sub-station there with all of its contents, has it not? *A* No. I think we have owned all of them for—if I look at these papers, I think I can give you the date.

* * * * * * [731]

By Mr. Branch: *Q* Now, Mr. Tiffany, the Borough of Groton has operated the facilities which it has owned from time to time, has it not? *A* Yes.

Q And coming now to the Trails Corner sub-station, there was a line, and is a line, which goes through the Borough sub-station and then serves numerous customers, is there not? *A* We have no sub-station at Trails Corner.

Q The Borough has no sub-station? *A* No sub-station. A secondary sub-station. We do have a distribution sub-station.

Q Well, that is what I referred to? *A* Yes.

Q But the lines that went down to Groton Long Point didn't go through that sub-station, did they? *A* Yes, went through—what particular sub-station are you asking about?

Q There was a 33,000 volt double circuit line from Trails Corner directly down to the Groton Long Point sub-station, was there not? [732] *A* Yes.

Q And then at Trails Corner, there were also lines that ran through the Borough's distribution sub-station? *A* Yes.

Q And those lines were not connected with Fishers Island at any time, were they? *A* No.

Q Now, I call your attention to the provisions in the contract of March 31, 1930, between the Connecticut Light and Power Company and the Borough of Groton, and show you this provision:

> "The power company shall deliver the electric energy herein contemplated at its sub-station located near Trails Corner in the Town of Groton, at Groton Long Point, in the Town of Groton, and at such other points as may be mutually agreed upon."

Then also, on the next page:

> "The delivery points shall be the low tension terminals of the transformers now installed, or other transformers in substitution therefor, at the above-mentioned sub-station of the Power Company at Trails Corner in the Town of Groton, the end of existing 33,000 volt transmission line at Groton Long Point, and such other points as may be mutually agreed upon."

Trial Examiner: State what page of the contract that is [733] on.

Mr. Branch: The first abstract is on page 1, and the second is on page 2 of the copy as I have it here.

Trial Examiner: Is that a copy of the agreement as attached to the stipulation?

Mr. Branch: Yes, I think so. I am not sure the pagination is precisely the same, but I suppose so. I think the pagination is the same.

[734] By Mr. Branch: *Q* At that time those were the delivery points, were they not?

Mr. Wahrenbrock: Excuse me. At what time, please?

Mr. Branch: When this contract first went into effect.

Mr. Wahrenbrock: Mr. Examiner, we have not gone back of 1935, so far, on the direct examination.

Trial Examiner: I think in the direct examination the examination was confined to the time since August, 1935.

Mr. Branch: All right. I don't care about going any further back than that.

By Mr. Branch: *Q* Now, I wish to show you the letter from the Connecticut Light & Power Company to the Borough of Groton of June, 1940—

Mr. Wahrenbrock: Could you give that date more definitely?

Mr. Branch: I think it is June 14th, 1940.

Mr. Wahrenbrock: Are you referring to the letter which is attached to the Stipulation?

Mr. Branch: I think so. The only trouble is that these are such a large bunch that I find it very difficult to locate anything. Yes, it is the letter of June 14th, 1940.

By Mr. Branch: *Q* I show you this and ask you what it is.

Mr. Wahrenbrock: Mr. Examiner, the word "this" that the [735] respondent has used, will be ambiguous in the record. May it not appear that the reference is to the letter which is identifiable?

By Mr. Branch: *Q* I refer you to a letter—there was a letter which has been referred to by you, Mr. Tiffany, I think, as the letter of June 14th, 1940. *A* Yes.

Trial Examiner: May I ask one question to clarify this point? Was this the only letter of June 14th, 1940?

The Witness: I think there was another letter of June 14th, 1940.

Mr. Wahrenbrock: In that case, Mr. Examiner, I object to reference to a letter—an unidentified and an unproven document. May we have the reference to something that is identified and proved?

Trial Examiner: I think in view of the statement of the wit-

ness that there are two letters of that date, it might be well to refer to it as the document appearing in the stipulation.

Mr. Branch: I would, but those documents have not yet been admitted.

Mr. Wahrenbrock: I will be glad to assist you by giving you my copy of the attachments to the stipulation.

Mr. Branch: Thank you.

[736] By Mr. Branch: *Q* Will you look at the copy of the letter of June 14th, 1940 which Mr. Wahrenbrock has just handed to me, as a copy of a letter attached to the stipulation, on the letterhead of the Connecticut Light and Power Company, addressed to you. Does that contain the following:

> "Service to be delivered and metered at the 33,000 volt terminals of the Company's transmission line at the Borough's Trails Corner Substation, the Borough to furnish and maintain all receiving, transforming protecting, regulating and distributing facilities required to receive and utilize the service."

A Yes.

Mr. Wahrenbrock: May I have the first part of the question read? It is so long that I lost it.

Trial Examiner: The reporter will read the question back for the benefit of Commission Counsel.

(The question is repeated.)

By Mr. Branch: *Q* And has that been the arrangement for servicing and metering for some time? *A* No.

Mr. Wahrenbrock: Mr. Examiner, I object to "for some time".

Trial Examiner: I think definite dates should be set.

[737] By Mr. Branch: *Q* And how long has it been the arrangement?

Mr. Wahrenbrock: May the answer which came so quickly that I did not have an opportunity to insert my objection be stricken, and may the question be reframed and properly?

Trial Examiner: It will be so stricken.

Mr. Branch: I thought I did reframe it.

Trial Examiner: He had already answered it, however.

By Mr. Branch: For how long has that arrangement in regard to servicing and metering been in effect? *A* It is not in effect and has not been in effect.

Q It is not in effect? *A* No.

Q Where is the metering done at the present time? *A* The metering is done at the present time by the Borough of Groton's electrical department's meters on the secondary side of the transformers.

Q And how long has it been done there? *A* For about two and a half months.

Q And before that, where was it done?

Mr. Wahrenbrock: Mr. Examiner, may the question be made more definite as to what period of time?

Trial Examiner: I think that question can follow this one.

The Witness: The metering prior to the period which I just [738] said, two and a half months, was done at the high voltage terminals of the Trails Corner Substation.

By Mr. Branch: *Q* Was that the point of delivery and the point of metering from the time of 1935 on? *A* Yes, sir.

Mr. Wahrenbrock: Mr. Examiner, may the question be separated into its two parts and put independently?

Mr. Branch: He has answered it and said "Yes".

Trial Examiner: I think he said the point of delivery and the point of metering. Do you want to separate that?

Mr. Branch: They were the same, I understand.

Trial Examiner: Will you read the question, so that counsel may hear it?

(The question is read.)

Mr. Wahrenbrock: I move that the answer be stricken and the question divided.

Trial Examiner: What division does counsel desire?

Mr. Wahrenbrock: To ask a response as to the point of delivery and a separate response as to the point of metering.

Trial Examiner: I think that can be clarified by asking if the point of delivery and the point of metering were the same.

By Mr. Branch: *Q* From 1935 until the last few weeks, the point of de- [739] livery and the point of metering were the same, were they not, Mr. Tiffany? *A* Within a very few feet.

Q At the point you have indicated? *A* At the point I have indicated.

Q On the high tension side of the transformers at Trails Corner? *A* Yes.

Q Now, Mr. Tiffany, I want to go into the situation as it exists at the present time. Have you any contract with Fishers Island Farms, Incorporated or any other organization, to supply electric energy to Fishers Island at the present time? *A* No.

Mr. Wahrenbrock: Mr. Examiner, I object to that question. It does not appear that there is a Fishers Island Farms, Incorporated, at the present time.

Mr. Branch: I said "any other company serving Fishers Island".

Trial Examiner: The question may be answered.

The Witness: No.

By Mr. Branch: *Q* You did have a contract, did you not, with Fishers Island Farms, Incorporated?

Mr. Wahrenbrock: Mr. Examiner, may it be made specific, as to the time?

[740] Mr. Branch: I think I have got to ask my questions one at a time.

Trial Examiner: I think counsel may ask the question and then if the answer is not clear or involves an answer to more than one question, a motion to strike will be in order.

By Mr. Branch: *Q* Until some time in May or June, 1940, did you have a contract with Fishers Island Farms, Incorporated? *A* Yes, sir.

Q And was that contract cancelled by your Board of Utilities Commissioners, by formal action? *A* Yes.

Q And have you any contract with anyone for supplying electric energy to Fishers Island at the present time? *A* No.

Q You ceased furnishing any electric energy to Fishers Island on February 9th, 1941? *A* To the best of my belief.

Q I show you what purports to be a certificate by you in regards to the cancellation of that contract and ask you whether that is a correct copy of the vote of the Groton Utilities Commissioners.

Mr. Wahrenbrock: May the document referred to be identified, so that it will be clear on the record just what is being referred to?

[*741*] Trial Examiner: I understand counsel proposes to offer this as an exhibit?

Mr. Branch: Yes.

Trial Examiner: If so, I think the preliminary question is sufficient identification.

[*742*] By Mr. Branch: *Q* Will you answer the question? *A* Yes.

Mr. Branch: I ask that the document I have just mentioned be marked Exhibit No. 20 for identification.

Trial Examiner: It may be so marked.

(The document referred to was marked as Exhibit No. 20 for Identification.)

Trial Examiner: May I have a copy of that.

(Copy handed to Trial Examiner.)

Mr. Branch: I offer in evidence Exhibit No. 20 for Identification.

Mr. Wahrenbrock: No objection.

Trial Examiner: Exhibit No. 20 will be received in evidence.

(Exhibit 20 for Identification received in evidence as Exhibit 20.)

By Mr. Branch: *Q* Mr. Tiffany, has the Borough of Groton supplied any electric energy to Fishers Island since February 8, 1941? *A* The charging current of the cable to Fishers Island, which we connected until February 28, 1941, was billed to Fishers Island.

Q And did you exchange letters with Fishers Island Electric Corporation in regard to that matter in February, [*743*] 1941. *A* Yes. February 28th.

Q I show you what purports to be a copy of a letter from Fishers Island Electric Corporation to the Borough of Groton, dated February 27, 1941, and also what purports to be a letter from the Borough of Groton Utility to the president of Fishers Island Electric Corporation, dated February 8, 1941, and ask you whether those are copies of letters which were sent and received at about that time? *A* Yes.

Mr. Branch: I ask that the letter of February 27, 1941, to which I have just referred, be marked Exhibit No. 21 for Identification, and that the letter of February 28, 1941 to which I have just referred be marked Exhibit No. 22 for Identification.

Trial Examiner: The reporter will so mark them.

(The documents referred to were marked as Exhibits Nos. 21 and 22 for Identification.)

Mr. Branch: I now offer in evidence Exhibits Nos. 21 and 22 for Identification.

Trial Examiner: Is there any objection?

Mr. Wahrenbrock: No objection.

Trial Examiner: Without objections, Exhibits 21 and 22 will be admitted.

(Exhibits 21 and 22 for Identification received in evidence [744] as Exhibits 21 and 22.)

By Mr. Branch: *Q* Mr. Tiffany, I call your attention to a sentence in this letter which is now Exhibit No. 21, the letter from the Fishers Island Electric Corporation to the Borough of Groton which says, "After midnight on February 28, 1941"—I will read the first paragraph:

> "Acting on your official notification and request (voted by your Board of Utility Commissioners) as set forth in your letters to Fishers Island Farms, Inc., dated June 4, 1940, this corporation as assignee of Fishers Island Farms, Inc. proceeded promptly to construct its own source of power on Fishers Island. This construction work was substantially completed on February 9, 1941 and accordingly, no electric

energy has been purchased or received from you since February 8, 1941. After midnight on February 28, 1941, it will be unnecessary for you to supply us with any electric energy and you can sever connection with our cable."

A Yes.

Q The letter contained that paragraph, did it not? *A* Yes.

Q Since that time, have you had a contract with the Fishers Island Electric Corporation, or anybody else, for supplying electric energy to Fishers Island? *A* No.

[745] *Q* Now, after the receipt of the letter of February 28, 1941, from which I have read an abstract—or February 27, 1941—did you sever connections with the Fishers Island cable? *A* Yes.

Q Am I correct in my understanding that on February 9, 1941, switches at the Fishers Island end of the cable on the mainland were open? *A* No.

Q You don't know about that? *A* No, they were not.

Q They were not? *A* They were not opened then.

Q When were they opened? *A* February 28th.

Q I am saying Fishers Island, Mr. Tiffany. *A* Yes, I realize you did.

Q Well, your understanding is that the switches at Fishers Island were not opened then? *A* When is that?

Q February 9th. *A* They were not opened then.

Q Well, did not this letter to you say that they had been receiving no energy since that time? *A* They said so, but they received energy since that time. Since then they telephoned me, and we made arrangements until [746] March 1st.

Q You say their letter to you is in error in saying that they received no energy since February 8, 1941? *A* Upon receipt of the letter I asked them if they wanted to be actually disconnected, or if they wanted to still have standby power there, and he answered in the affirmative.

Q You mean that merely the cable was energized? *A* Yes.

Q You didn't actually deliver any electric energy that you charged for after February 9th? *A* Yes, the energy used for energizing the cable.

Q Just for energizing? *A* Well, I don't know whether there was any more or not, but that much was there surely.

Q Well, regardless of that, did you—and when I say you, I of course, mean the people under you at your direction—open the switches at the sub-station on the shore at Groton which supplied the Fishers Island cable on March 1, 1941? *A* Yes.

Q And did you then also remove the conductors between those switches and the cable pot heads? *A* Yes.

Q And in the first few days of March, did you also start taking down the double circuit 33,000 volt line near the Trails Corners sub-station? [747] *A* We started to take down one of the double circuit lines.

Q And did you also disconnect the line running into the sub-station a mile from the shore, which connected the line formerly running out of the sub-station? *A* Yes.

Q Now, by March do you recall that there was a certain party that went with you around and looked at the facilities, on or about March 21st of this year?

Mr. Wahrenbrock: Mr. Examiner—

Trial Examiner: I think the question is a little vague.

By Mr. Branch: *Q* Did you make an inspection of some of the facilities about the 21st of March, Mr. Tiffany—of your facilities? *A* I inspected the facilities very often, but could not say the date.

Q Well, as I understand it, you started in March to dismantle and remove the entire line from Trails Corners to Groton Long Point sub-station, did you not? *A* No.

[748] *Q* Well, now, will you explain what has been done? *A* After the discontinuance of the 33,000 volt circuit, we used one of these circuits to supply the Groton Long Point at 2,300 volts. The part which was unused we did start to dismantle, but we are still using part of that line for 2,300 volt distribution.

Q The line starts right at Trails Corner, does it not? *A* And is it not true that for a considerable distance, both circuits from Trails Corners, both lines, have been removed? *A* What date?

Q They have now been removed? *A* Yes.

Q So that as you stand at Trails Corner and look down, you can see none of either of the circuits which go down to Groton Long Point. That is correct, is it not? *A*. That is correct.

Q And about what was the distance from Trails Corner Substation to Groton Long Point Substation? I mean the 33,000 volt line.

Mr. Wahrenbock: Mr. Examiner, I don't believe the question is clear.

Mr. Branch: If it is not, I will reframe it.

By Mr. Branch: *Q* What was the approximate length of the distance of the double circuit 33,000 volt line from Trails Corner to the [749] Groton Long Point Substation? *A* Maybe five and a half miles.

Q And how much of those two double circuits, 33,000 volt lines, between Trails Corner and Groton Long Point substation are left now?

Mr. Wahrenbrock: Mr. Examiner, the witness has just said that there is not any 33,000 volt line now there at all.

Trial Examiner: No, the witness did not say that. He said he could not see any from the Trails Corner Substation now.

Mr. Wahrenbrock: Previous to that he said what was there was operated at 2,300.

Mr. Branch: I will clear this up if there is any doubt.

By Mr. Branch: *Q* It is true, is it not, that you are not operating any 33,000 volt line between Trails Corner Substation and Groton Long Point Substation? *A* Yes.

Q And it is true, is it not, that for a considerable distance south of Trails Corner, all of the lines and poles which were formerly used there have been taken away? *A* Yes.

Q And it is true, is it not, that all of one of those lines, all

the way from Trails Corner Substation to Groton Long Point Substation has been entirely removed?

[*750*] Mr. Wahrenbrock: Mr. Examiner, there has been no testimony about more than one line. There is testimony about two circuits, but there is no testimony about two lines.

Mr. Branch: I will change it to "circuits", then.

The Witness: May I please have the question again?

(The question is repeated.)

The Witness: No.

By Mr. Branch: *Q* What is left between those two points now? *A* Everything except the wire. The cross arms and the poles are left.

Q Haven't some poles and some cross arms been removed that were supporting this double circuit 33,000 volt line between Trails Corner Substation and Groton Long Point Substation? *A* Yes.

Q And will you tell us now what there is left in the way of equipment that did constitute or support those two circuits, between Trails Corner and Groton Long Point Substation? *A* That part of the former lines which were formerly 33,000 volts is now used for distribution by Groton Long Point at 2,300 volts. Approximately half of the line.

Q That is just one of the circuits? *A* One of the circuits.

[*751*] *Q* And is it true that all of one circuit has been removed and at least half of the other circuit? *A* All of the wires.

Q Yes. My statement is correct, is it not? *A* You said all of the circuit has been removed?

Q All of the wire on one of those circuits from Trails Corner Substation to Groton Long Point Substation has been removed, has it not? *A* Yes.

Q And for about half of the distance the wire has been removed on the other circuit, has it not? *A* Yes.

Q And some of the poles and cross-arms have been removed, have they not? *A* Yes.

Q How much of that has been removed? *A* Approximately half of the total.

Q That is for both circuits? *A* Both circuits.

Q So it is true, is it not, that for a distance of some two miles going south or east, if that is the direction in which the line went from Trails Corner to Groton Long Point Substation, everything that was there has been removed? *A* Yes, sir.

Q Now, coming to Groton Long Point Substation—

[752] Mr. Wahrenbrock: (Interrupting). Mr. Examiner, may the question specify which of the two substations in Groton Long Point?

By Mr. Branch: *Q* By the Groton Long Point Substation I mean the one in which there were transformers which changed the energy from 33,000 to 6600 volts. The one that is about a mile from the shore. Now, in that substation there were transformers, were there not? *A* Yes.

Q And have those transformers all been removed. *A* Yes.

Q And was there other equipment in that substation? *A* Yes.

Q And has that all been removed? *A* Not to my personal knowledge, but I believe it has been removed.

Q But substantially that substation has been dismantled, so that it cannot be used, has it not? *A* Yes.

Q And it is true, is it not, that you would have to replace transformers and reequip that substation if you were to have the service that you did have, or anything approximating it, going to Fishers Island? *A* You made your question too broad; I will have to answer [753] "No".

Q What is there left in that station? *A* Poles and structures.

Q But there are no transformers there? *A* No.

Q Are there any circuits, or conductors which are connected and in operation, going through that station? *A* No.

* * * * * * [754]

By Mr. Branch: *Q* Now, going south from that substation to the little substation which was on the shore to about a mile south of the substation that we have just been talking about is a small station very near the shore, is there not, Mr. Tiffany? *A* Yes.

Q As I understand it, you pulled the jumpers at that substation on March 1st, is that right? *A* Yes.

Q Will you explain what pulling the jumpers means? *A* I don't recall that specific title, but it was meant that the potheads were disconnected from the oil switches by the short wires commonly called jumpers.

Q And the conductors which led the cable have actually been cut off, have they not? *A* Yes.

Q So that there is no connection, or even an open switch by which they could be connected at that point? [755] *A* That is as of March 1st. There is nothing left, not even switches, buffers or anything else pertaining to the cables to Fishers Island.

Q It was all taken out in March? *A* Beginning March 1st or 2nd.

Q And did you also actually cut both of the 33,000 volt circuits at Trails Corner on March 1st? *A* No.

Q What was done in regard to cutting those lines on those circuits at Trails Corner? *A* We cut one 33,000 volt circuit and used the other circuit as 2300 volts for continuity of service to Bradmore Point.

Q Both of those lines have now been cut? *A* Yes. May I qualify the answer, please?

Q Were you talking to me? *A* Yes. May I qualify that answer?

Q Certainly. *A* They were both disconnected at Trails Corner substation near the first of March.

* * * * * * [757]

By Mr. Branch: *Q* The Borough of Groton, of course, had a large number of other customers besides Fishers Island Farms, Incorporated, had it not, for electric energy? *A* We had—the general customers, you mean?

Q Yes. *A* Yes.

Q I mean, most of the electric energy which you distributed was distributed and used by customers in the Town of Groton, in Connecticut, was it not? *A* At nearly all times, yes.

* * * * * * [758]

By Mr. Branch: *Q* Using this as a basis for your answers, Mr. Tiffany, will you tell us during the last four months of 1935, what the sales by the Borough of Groton to Fishers Island Farms, Inc. was? *A* 500,400.

Q Kilowatt hours? *A* Yes.

Q And the figures that you give hereafter are all kilowatt hours? *A* Yes.

Q And for the year 1936. [759] *A* 1,348,200 kilowatt hours.

Q And for the year 1937. *A* 1,454,400, kilowatt hours.

Q And for the year 1938. *A* 1,429,150, kilowatt hours.

Q And for the year 1939. *A* 1,435,600 kilowatt hours.

Q And for the year 1940. *A* 1,504,800 kilowatt hours.

Q And for the year 1941 to date. *A* I have no records to date.

Q Well, this is for the first two months here, is it not? *A* Yes.

Q And you haven't supplied anything since the end of February? *A* No.

Q So the two months' figure would be for the entire time up to date? *A* Yes. 215,280 kilowatt hours.

* * * * * * [760]

Q Mr. Tiffany, I show you what purports to be a copy of a letter from you to Mr. Lindsley, vice-president of the Connecticut Light and Power Company, dated October 30, 1940, and attached to it what purports to be a copy of a letter from A. V. S. Lindsley, vice-president, to you, dated October 23rd, 1940, and I ask you whether those are copies of letters which were sent and received at or about the times mentioned?

Mr. Wahrenbrock: Mr. Examiner, I object to that question, because no basis has been laid for assuming that the witness knows anything about the receipt of the letter of October 30th, 1940.

By Mr. Branch: *Q* Did you mail the letter, Mr. Tiffany, on or

about October 30th, 1940, in the United States Mails, addressed to Mr. Lindsley, of which that is a copy? *A* Personally?

Q Did you give it to someone on your staff to mail? *A* Yes.

Q And as far as you know, was it mailed? *A* It was.

Q Did you receive a letter of which the other document dated October 23rd, 1940 is a copy? *A* Yes.

Mr. Branch: I ask that the first of these in point of [*761*] date, that is, that of October 23rd, 1940, be marked Exhibit 23 for Identification, and the one dated October 30th, 1940 be marked Exhibit 24 for Identification.

Trial Examiner: They will be so marked.

(Letter referred to was marked Exhibit Number 23 for Identification.)

(Letter referred to was marked Exhibit Number 24 for Identification.)

Mr. Branch: I offer in evidence Exhibits 23 and 24 for Identification.

Mr. Wahrenbrock: No objection.

Trial Examiner: Without objection the documents marked Exhibits 23 and 24 for Identification will be admitted in evidence.

(Exhibits Numbers 23 and 24 for Identification are marked Exhibits Numbers 23 and 24 in Evidence.)

* * * * * * [*763*]

EMIL J. AMBERG,

a witness produced on behalf of the Federal Power Commission, being first duly sworn, testified as follows:

Direct Examination by Mr. WAHRENBROCK.

Q Mr. Amberg, what is your address? *A* Waterbury—my home address?

Q Yes. *A* 53 Euclid Avenue, Waterbury, Connecticut.

Q What is your position with the Connecticut Light and Power Company? *A* Research engineer.

Q Will you explain the duties of the research engineer in the

respondent corporation? *A* General studies in connection with system loads, and future planning, studies in—economic studies of cost, power cost for electric service, gas service, and many special problems that are put up to me. There are no routine duties connected with my job. One of the things that is under my direction at the present time is the preparation of reports of all kinds.

Q Including reports to regulatory agencies? [764] *A* Yes.

Q Does that complete your general statement of the duties of that position? *A* Yes, because the other work I do can't be specified specifically like that. Miscellaneous jobs that come up, of you might say, a consultant nature to various departments of the company.

Q You are the head of a unit in the organization of the company, are you? *A* Yes.

Q How large is that unit? *A* Well, there are six people besides myself.

Q What type of training do those people have? *A* Well, one is an engineer, two of them are statisticians, clerical work, statistical work. There are two girls, clerks, and one girl who is a mathematician for the principal in the high school before she was employed by the company.

Q What is the nature of your own training? *A* I went to the Federated Polytechnic in Zurich, which is comparable to M.I.T. in the United States. I took courses in mechanics and electrical engineering, majored in mechanical engineering and obtained a degree in mechanical engineering. I also took some special courses after I graduated in power plant design, railroad electrification, structural steel, reinforced concrete.

[765] *Q* How long have you been with the Connecticut Light and Power Company? *A* Since 1916.

Q In what capacities have you been associated with the company since that time? *A* The previous title was electrical engineer, and in that I had principal charge of the design work, and also during the last war the supervision of the operation of power plants and transmission lines.

Q Do you conduct studies and make reports when the development of the company's load gives rise to need for change or expansion of plants? *A* I do.

Q Do you study maintenance problems? *A* No.

Q You have no responsibility in connection with maintenance? *A* No, sir.

Q Do you conduct any experimental research? *A* No, sir.

Q Do you study questions of capacities which should be provided? *A* I don't quite get the significance of the question.

Q Do you advise upon the capacities of generating and transmission equipment which should be installed? [766] *A* In a preliminary way, yes.

Q Do you conduct studies with respect to the replacement of facilities? *A* Well, incidental to providing additional capacity, yes.

Q I believe you stated that you made studies of load growth? *A* Yes, sir.

Q Will you explain a little bit more about the nature of such studies? *A* Well, we make forecasts to determine the trend so that we have basic data over a long enough period so that we can make preparations for additional facility capacity, principally, at an early enough date, by checking all the facts that are available to us, and also keep currently track of whatever information we can get of changes that take place, particularly data for manufacturers as to their plants.

Q How long a period of time do those forecasts cover, as a matter of practice? *A* Well, we consider five years. Of course, we extend beyond five, but if you extend beyond five years, even five years it is a period that is very often somewhat difficult to be very sure. That is why we refer to most of our forecasts as normal.

[767] *Q* Forecasts for that period of time are in practice used by the Company in planning its capital investment and expansion of its plant, are they? *A* Yes.

Q Would such forecasts include consideration of the question

of the need of increasing the capacity of substations and transmission lines? *A* Transmission lines are included, but not substations.

Q Will you explain why substations are not included? *A* Well, the operating department usually follows that from their local data.

Q But your forecasts do take into account the need for new plant construction of other nature? *A* Yes.

Q In general, you do the work of planning for the future for the Company? *A* Yes.

Q And when you have conducted a study, do you make a report, embodying your conclusions, and setting forth your reasons for the conclusions? *A* Yes. Sometimes it is just in letter form.

Q To whom do you report? Who is your superior in the organization of the Company. *A* Mr. R. H. Knowlton, Executive Vice President.

Q Does the Company make available to you for the purposes [768] of the work that you have to do, the data and material which is available in the organization for those purposes? *A* Yes, sir.

Q Do you do the work with respect to the design of new equipment? *A* No.

Q With respect to the remodeling of equipment? *A* No, sir.

Q And with respect to the replacement of equipment? *A* No, sir.

Q Your research is not limited, I take it from what you have said, to the purely electric engineering aspects of problems, but takes into account their economic aspects? *A* That is right.

Q You consider the questions of the most economical mode of operating and building plant that is required? *A* Well, in the initial study we make comparisons as to which, in our opinion, is the most economical type of equipment to add to the system. When it comes to the economical operation, the every day operation, I have no duties in connection with that.

Q But in planning future development, you would take into account the economy of operation of various types of planned equipment? *A* We do.

[769] *Q* Do you also have to consider the economy of various sources of electric energy? *A* (No response.)

Q Do you study the costs of producing electric energy? *A* In different ways?

Q Yes. *A* Yes, we do. I do include different methods.

Q By "different methods" do you mean a comparison of purchase as against generation by the Company under particular circumstances? *A* No, I would not consider purchase, because I would have no data on which to base purchase cost.

Q Where the company has contracts for the purchase of electric energy, you would have data available which you could consider? *A* Yes, where we have contracts.

Q Have you conducted studies to determine the relative economy of generation of energy by the Company itself in lieu of purchase of energy, under such circumstances? *A* We have in isolated cases made checks.

Q Your research also covers questions of the sufficiency of reserve generating capacity? *A* That is an integral part of any study.

Q In such studies, are individual studies made with respect to each division or district of the Company, or is [770] some average load growth factor used in estimating growth load? *A* Our studies are for the Company as a unit.

Q In making such studies, do you use a single load growth factor for the entire Company, or do you use different load growth factors for different-- *A* (Interrupting) We use different load growth factors.

Q (Continuing) —for different divisions of the Company. *A* Yes, for different parts of the Company.

Q Are you familiar in a general way with the Company's purchases of electric energy from the Torrington Electric Light Com-

pany at Torrington and its sale of electric energy to the same company there? *A* Very generally, because it is not my duty to be specifically familiar with it.

Q Have you made any study in connection with that situation? *A* Several years back we made one analysis of cost as applying to our system, I believe.

Q Are you familiar with the change in the arrangement of facilities at Torrington, to which Mr. Campbell referred earlier in the course of this proceeding, as taking place within the last few months there? *A* I have not seen the new facilities.

[*771*] *Q* I did not ask you if you had seen them. I meant if you are familiar in a general way with what has been done there? *A* Yes, in a general way.

Q Do you know whether the Torrington Company is now purchasing any electric energy from the Connecticut Light & Power Company generated at the Robertsville Plant? *A* I don't know.

Q You don't know? *A* No.

Q Now, do you know whether that supply of electric energy from the Robertsville Plant to Torrington, where there is an excess, has been terminated or not? *A* I don't know.

Q In a situation like that which prevailed prior to the recent change at Torrington, where the Torrington Electric Light Company was selling electric energy to the Connecticut Light and Power Company and at times the Connecticut Light and Power Company was selling electric energy to the Torrington Company when it had excess energy from the Robertsville Plant, is it possible to determine the total amount of electric energy supplied in each direction over a circuit, for a period of time?

Mr. Branch: Excuse me, may I have that question read, please?

[*772*] Trial Examiner: Read the question for the benefit of respondent's counsel.

(The question is read.)

The Witness: There are meters which are read to indicate flow between readings, and these meters are used for billing—these meter readings are used for billing.

By Mr. Wahrenbrock: *Q* Is there more than one meter to measure flow in both directions? *A* I am not familiar with the meter arrangement. I don't know what meters are there for measuring.

Q There are meters available for measuring flow in one direction over such a circuit under those conditions? There are such meters designed? *A* There are meters that are used for that purpose.

Q What type of meter is that? How is it generally referred to? *A* A watt-hour meter is one meter. Then there are recording meters of various kinds.

Q Where it is desired to measure the flow of electric energy over a circuit in one direction and energy during a period of time flows in both directions over that circuit, will the ordinary watt-hour meter show you the total flow in one direction? *A* If there is one watt-hour meter connected?

[773] *Q* Yes. *A* Whether that watt-hour meter will show what? I am not quite clear on the question you asked.

Trial Examiner: The reporter will repeat the question.

(The question is repeated.)

The Witness: No.

[774] *Q* Is there a meter that will show you the flow in one direction? *A* A watt-hour meter with a ratchet.

Q And in order to obtain the total flow over that same circuit in the opposite direction during the same period, can a second ratchet meter be used to show the flow in that direction? *A* As I understand it, yes.

Q Then the watt-hour meter with a ratchet does show the total amount of energy flowing in one direction over a circuit during a given period of time, although there may be energy flowing in both directions over that circuit during that period of time?

Mr. Branch: May I have that question?

(Whereupon the last question as above recorded, was read by the reporter.)

Mr. Branch: I don't quite understand the question. You mean

energy flowing in both directions at the same time, or at different times, during certain periods?

Mr. Wahrenbrock: During the total period of time energy flowing in both directions, flowing only in one direction at any given instance.

By Mr. Wahrenbrock: *Q* With that explanation, can you answer the original question, Mr. Amberg? [775] *A* The explanation you added there kind of confused me.

Trial Examiner: I think the explanation was for the benefit of counsel, not for the witness, primarily. Perhaps if you will reread the original question—

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: The generally accepted use of the meter is in that way.

Trial Examiner: Does that answer the question?

Mr. Wahrenbrock: I believe it does, Mr. Examiner.

By Mr. Wahrenbrock: *Q* Where there are two ratchet meters in a circuit, over which in the course of a given period of time electric energy flows in both directions, is it possible at any given instance to determine, by looking at the meters in which direction the energy is flowing? *A* I am not too familiar with construction of meters, to be sure of answering correctly.

Q Well, I didn't realize that there was a question of that nature involved. I assumed that when you had two such ratchet meters you could look at them, and it was a matter of common experience that one of them would be recording and the other one would not be, at any given instance, and by seeing which was recording you could tell which direction the energy was flowing in. Am I not correct in that? [776] *A* Well, you would have to observe the meter long enough so that you could notice a recording on one of the meters.

Q Yes. If you saw the disk on the meter, the aluminum disk that we all are familiar with, if it is aluminum, if you saw that revolving on one, you could tell which direction the energy was

flowing in if you knew the hook-up of the meter, couldn't you? *A* Yes.

* * * * * * [777]

Q . . . Have you ever made a study of the cost of supplying electric energy to the Winsted district? *A* I think I have made a rough study.

Q When was such a study made? *A* I do not recall. I would have to look it up.

Q Has it been made within the last six months?

Mr. Branch: By him, you mean?

Mr. Wahrenbrock: Thank you, Mr. Branch; yes, by you.

The Witness: I do not want to answer that question without checking my records. I am not sure.

By Mr. Wahrenbrock: *Q* Have you ever made a study, or has a study been made by any men under your supervision with respect to a proposed supply of electrical energy to Winsted by a new line from [778] Waterbury? *A* I have checked that myself.

Q You have studied— *A* At one time, but I do not know the exact date.

Q You have studied that yourself? *A* Yes, at one time.

[779] *Q* In making that study, did you consider as one of the factors, the cost of generating electric energy by the steam generators of the Torrington Electric Light Company? *A* No.

Q In making that study, did you take into account the cost of purchasing electric energy—

Mr. Branch: (Interrupting) I object.

Mr. Wahrenbrock: May I complete the question?

Mr. Branch: Pardon me.

By Mr. Wahrenbrock: *Q* (Continuing) From the Torrington Electric Light Company.

* * * * * *

Mr. Branch: I object. I must say that I am quite in the dark as to any materiality of any of the questions that have been asked Mr. Amberg. Now it would appear that we are going into details

of some cost-study. I cannot see how that has any possible bearing upon the question of whether the Federal Power Commission has jurisdiction over this utility or not. It cannot depend upon any such matters as are being inquired into. I think this whole examination—as I say, I have been in the dark,—I was thinking continually that something would develop which would show materiality, and it seems [*780*] to me we are now entering a subject which is very clearly immaterial, and I object to it for that reason.

* * * * * * [*785*]

Trial Examiner: It seems to me it may very well be material, and we will permit the evidence if that is the purpose of it. I will permit the question to continue, and counsel may have an exception and may later move to strike if it is not developed to be material.

Mr. Branch: And may it be stipulated at this time that I have an objection to all further questions along the line of studies in regard to this matter.

I might say that I noted in certain parts of this transcript that where I had made an objection, there was no statement that an exception was noted. I thought the Examiner had indicated that he expected to have the word "exception" put in wherever that occurred.

Trial Examiner: Yes, where it is possible for the reporter to determine. Sometimes it is difficult for the reporter to determine that fact.

Mr. Branch: I am perfectly satisfied as long as it is understood that the word objection also means that an exception is taken, or that where any ruling is given which is adverse to the party objecting or offering—that it is considered that an exception is taken.

Trial Examiner: It will be so understood that where an objection is overruled an exception is automatic.

* * * * * * [*786*]

A In so far as the cost of power from the Torrington Company

is concerned, the only thing I took into account was the contractual price existing at the time.

Q Did you take into account additional payments to be made to the Torrington Company for its out of pocket expenses in supplying the Connecticut Light and Power Company with electric energy generated by its own steam plant? *A* I have at no time made any study or any report of obtaining power from the Torrington Company steam plant.

Q In the study of comparative costs to the Connecticut Light and Power Company of electric energy purchased from the Torrington Company, and electric energy supplied from its own system at Waterbury, did you take into account the relative reliability of service from those two sources? *A* No, I did not.

Q Have you made any study of that question? *A* Personally, I have not.

Q Was any such study made? *A* I cannot be sure. However, I believe I have seen a statement referring to the interruptions at Winsted.

[787] *Q* You mean during the 1938 flood and hurricane? *A* I don't know.

* * * * * * [793]

Q From what sources is Bristol usually served? *A* I don't know.

Q You were associated with the Connecticut Light and [794] Power Company at the time it participated in the Connecticut Valley Power Exchange, were you not? *A* Yes, sir.

Q Did you never have to make any studies in connection with the operations of that Exchange? *A* That was all handled by the Operating Department, and I did not belong to the Operating Department.

Q You have never made any study or had any knowledge of the operations of that Exchange? *A* Very generally, only.

Q As a matter of fact, you know the principal sources of supply used in the operation of that Exchange, didn't you? *A* No. I know some of them.

Q You knew the principal sources of supply used in the operation of that Exchange at the time the Connecticut Light and Power Company was a member of it, didn't you? *A* I would not be sure that I knew about all of them.

Q You knew that at that time there was available for supply of electric energy requirements at Bristol energy which either came down from the Hartford-Agawam line or was generated at Hartford or was generated at Falls Village, or was received from the Central Hudson Gas and Electric Company, didn't you?

Mr. Branch: I object to that. There are about five questions in it, the "or", "or" and "or".

Mr. Wahrenbrock: It is all one single question.

[795] Mr. Branch: I object to it on the ground stated.

Trial Examiner: Is the witness able to answer the question as a whole?

The Witness: At the time our company was part of the Connecticut Valley Power Exchange, I had general knowledge that power came from various generating sources, including our own, in to Bristol.

By Mr. Wahrenbrock: *Q* What were some of those sources? *A* Connecticut Light and Power Company generating plants, Hartford Company generating plants, Connecticut Power Company generating plants and plants of the Western Massachusetts Company.

* * * * * * [796]

Q At that time you knew that in practice, the requirements for Bristol were supplied from one or more of those various sources, did you not?

* * * * * *

The Witness: Bristol obtained its power from the Connecticut Power Company's lines. That is all I have definite knowledge of. As to the particular source of power for Bristol, I don't know how to determine that.

* * * * * * [800]

Q Have you had occasion to study the effect of the maintenance

or failure to maintain a reasonable power factor on the economy of transmission line operation?

* * * * * *

A In studying transmission problems, we always take into account the power factor as one of the elements in the design [*801*] of the line.

Q Will you, for the benefit of those of us who are not technically trained, will you explain how the power factor affects the economical operation of a transmission line? *A* Low—what we call a low power factor absorbs or makes useless a part of the ability to transmit power. I don't know whether that will explain.

Q I think that is very helpful. If I understand it right, then, if a higher power factor is maintained, does it make the line more economical to operate?

* * * * * *

A Not necessarily. The expense to obtain a higher power factor may be excessive.

Q Then against the advantages obtained from the maintenance of a higher power factor in more economical operation of the transmission line, must be balanced the expense of obtaining that higher power factor, is that right? *A* Sure.

Q What is the effect of a low power factor on the maintenance of voltage of a transmission line? [*802*] *A* Transmitting a certain—I am trying to find out what the question is, the specific question, I am not clear.

Q For the purpose of the question, I will assume that the amount of power transmitted is unchanged. *A* The power factor will affect the amount of voltage drop in the line.

Q And how will it affect it? *A* The lower the power factor, the greater the drop—I believe to a certain point.

Q And what is the effect of a voltage drop in the operation of a transmission line? *A* It affects service.

Q And how does it affect service? *A* Low voltage.

Q That is, it adversely affects service, does it? *A* Yes.

Q What methods are there for maintaining a reasonable or proper or good power factor on a transmission line? *A* Apparatus referred to as condensers.

Q Any particular type of condensers? *A* There are static condensers.

Q Static condensers? *A* And there are rotating machines.

Q Rotating condensers? *A* Rotating machines, yes.

[*803*] *Q* Are they called rotating machines, or rotary condensers? *A* They are called condensers, synchronous condensers.

Q Synchronous condensers. Are generating units sometimes used as synchronous condensers? *A* We use some of our units occasionally.

Q You use some of your generating units as rotary condensers, occasionally? *A* Yes.

Q Do synchronous condensers serve any other purpose than to maintain power factors? Is the maintenance of power factors the principal objective? *A* Maintenance of voltage.

Q And that is dependent in part upon the maintenance of a proper power factor, is it? *A* Yes.

Q Well, I will put the question I asked you first: Is there any other purpose in the operation of a synchronous condenser than to maintain proper power factor and voltage on the transmission line? *A* Not that I know of.

* * * * * * [*833*]

Q I will show you a copy of Exhibit 26 for Identification and ask you whether as of June 30, 1939, this is a substantially correct representation of facilities owned and operated by the Connecticut Light and Power Company in and near East Hampton, Connecticut. *A* Since I am not connected with the Operating Department, I would have to obtain the information from others, as to whether it was or was not, because I did not, naturally, keep currently informed of all of the details, conditions or facilities of the company.

Q Well, Mr. Amberg, on the field trip inspection which Com-

mission counsel and engineers made in your company, did we not view some of these facilities, and didn't you explain to us what the facilities had been in and prior to 1939? [*834*] *A* Yes, but I am not familiar as to when certain things were changed or abandoned.

Q It is a matter of the exact date, then? *A* Yes.

Q If you cannot make a statement for June 30th or a particular day, can we say up until the discontinuance of the interconnection with the Connecticut Power Company in the town of Portland? *A* This is correct, as far as I can recall.

* * * * * * [*835*]

Q In the meantime, I will ask the witness one or two questions with respect to Exhibit 26. By referring to this exhibit, can you indicate the point at which the meters were located at which the electric energy purchased by the Connecticut Light and Power Company from the Connecticut Power Company up to approximately July 1, 1939, were located? *A* They were located just ahead of this point (indicating).

Q That is, referring to the point at which the dashed [*836*] line labeled "From Portland Connecticut Power Co. 13,800 v." joins the solid line marked "C. L. & P. Co., 13,800 v"? *A* Yes.

Trial Examiner: Towards the West High Substation or towards the Collins Hill Substation?

The Witness: Toward neither of those two. Toward the dotted line.

By Mr. Wahrenbrock: *Q* Was the metering equipment located on the line of the Connecticut Power Company? *A* I could not answer that question; I don't know where the line specifically ended.

Q Do you know who owned that meter or that metering equipment? *A* I don't recall that either.

Q What is Pole 110, which is referred to on the diagram on the map? *A* The location where that metering equipment was.

Q What was at that location?

* * * * * *

The Witness: I am not familiar with that detail.

By Mr. Wahrenbrock: [837] *Q* What do the figures and letters "13,800 v" indicate? *A* The nominal voltage on the lines.

Q And that voltage is 13,800? *A* Volts.

Q Are the lines indicated by the solid lines on this map single circuit lines or are some of them double circuit lines? *A* I could not answer that question either because I am not in close touch with those facilities. I have a general knowledge, but not specific knowledge as to details of that kind.

* * * * * *

Q Does the black line indicate a 13,800 volt electric line? [838] *A*. That is right.

Q What do the solid black triangles indicate? *A* They indicate sub-stations.

Q And do they indicate substations owned by the Connecticut Light and Power Company? *A* That is correct.

Q And the solid black lines and solid black triangles indicate facilities operated until approximately July 1, 1939, by the Connecticut Light and Power Company? *A* Yes.

Q Does the dashed line indicate facilities owned and operated until approximately the same date by the Connecticut Power Company? *A* As far as I remember, yes.

Q At the same time, were there other electric facilities of the Connecticut Power Company in the region shown on this map? *A* I don't know.

Q Well, at and near Colchester were there distribution facilities of the Connecticut Light and Power Company? *A* The Connecticut Light and Power Company, yes.

Q Were there lower voltage lines in the vicinity of Westchester, owned and operated by The Connecticut Light and Power Company? *A* Yes.

[839] *Q* And was the same true at Comstock Bridge? *A* As far as I know, yes.

Q And at West High Street Substation? *A* Yes.

Q And at the Leesville Substation? *A* Yes.

Q Had those facilities of the Connecticut Light and Power Company to which you have referred in your testimony been owned and operated since 1936? *A* May I get that question again?

Trial Examiner: The question will be read.

(The question is read by the reporter.)

By Mr. Wahrenbrock: *Q* During and since 1936? *A* Not all of those facilities.

* * * * * * [*840*]

Q I think I haven't framed the question I meant to put. Were substantially all of the facilities shown in solid black owned and operated by the Connecticut Light and Power Company during 1936 and up to approximately July 1, 1939? *A* Yes.

* * * * * * [*842*]

Q Mr. Amberg, I show you the top sheet of Exhibit No. 27 for Identification, and ask you if that sheet, together with the following two sheets, is a substantially correct representation of the facilities owned and operated by the respondent company at and in the vicinity of Winsted, Connecticut, and to Torrington, Connecticut? *A* The only answer I can make to that question is that it is a photostatic copy of the distribution maps as they were when we made a copy. As to how accurate they are, I don't know.

Q They are the maps used by the company in its operation [*843*] and in the conduct of its business? *A* They are the maps used by the company.

* * * * * *

Q Will you please explain, Mr. Amberg, the relation between —the relation on the first sheet of Exhibit No. 27, between the parallel, heavy dotted lines running down from Winsted through Burrville to the bottom of the map, and the insert on the lower right-hand corner of that map? *A* The relation—

Q Will you explain the relation between the insert and—

[844] *A* The insert is a continuation of the circuit shown on the main body of the map.

Q What does the heavy dotted parallel line represent? *A* A 27,600 volt open wire circuit, according to the legend.

Q Is that a double circuit or a single circuit line? *A* That is a two-circuit line.

Q What facilities are located in Torrington—what facilities of the Connecticut Light and Power Company are located in Torrington at the end of that line? *A* A transformer bank.

Q And what facilities are located in the Winsted—at the Winsted end of that line? *A* Two transformer banks, and some switching facilities.

Q What does the transformer bank in Torrington—what kind of transformers are those? *A* They are transformers used for stepping the voltage from 2300 volts to 27,600 volts.

Q What are the transformers at the Winsted end of the line? *A* They are used to step the voltage from 27,600 volts to 4600 volts.

[845] *Q* I ask you if you will explain by reference to these maps, where the Robertsville Hydro-Electric Plant of the respondent is located? *A* It is shown on the second sheet which is marked "Colebrook", close to the town line of Colebrook and Winchester on the Still River.

Q Will you describe the lines which connect the Robertsville Plant with the Substation of the Connecticut Light and Power Company in Winsted?

* * * * * * [847]

The Witness: It is one of the 4,600 volt distribution circuits of the Winsted District.

By Mr. Wahrenbrock: *Q* What is the capacity of that line? *A* I don't know.

Q In the normal operation of the company, is that line [848] connected through the substation at Winsted so that electric energy can pass from the Robertsville plant on to the 27,000 volt line

and from the 27,000 volt line through the transformers, on to the line at Robertsville? *A* May I have that question read?

(The question is repeated.)

The Witness: Yes.

By Mr. Wahrenbrock: *Q* Will you describe the substation in Winsted in general terms? *A* It consists of two transformer banks.

* * * * * * [850]

Q Mr. Amberg, I will ask you to consider an ordinary two-winding power transformer with primary leads, designated as A and B and secondary leads designated as C and D, and ask [851] you if that could not be used as an auto-transformer by connecting the leads B and C together and delivering the energy to the transformer over the leads A and B and taking the electric energy from the transformer over the leads A and D? Maybe you would like to have that read to you again?

* * * * * *

The Witness: I am not sure whether that would work or not. I am not acquainted with design problems of electric equipment. From the diagram, it would appear it might work.

* * * * * * [853]

Q Mr. Amberg, does an auto transformer consist of two coils on a core connected in series with three leads brought out from the case?

* * * * * *

The Witness: I am speculating in answering questions of that kind because I am not familiar with the design of [854] electrical equipment.

* * * * * * [855]

Q And then if you take an ordinary two-winding power transformer, and connect two of the leads together, as I have suggested to you previously, you would have in effect an auto transformer, have you not? *A* Diagrammatically, you have an auto transformer.

Q And so far as the principle upon which those transformers

operate, such a transformer would operate as an auto transformer, would it not? *A* I suppose it would.

Q Well, there isn't any difference in the principle upon which an auto transformer operates from the principle upon a two-winding transformer operates, is there? *A* That gets into theory. I don't feel qualified in answering that question.

Q Isn't that theory familiar to every engineer? *A* I am not familiar with the details of design.

Q I am not asking you about details of design. I am asking you about principles of operation. *A* I never operated a transformer.

Q You studied the theory upon which transformers do operate, haven't you? *A* No.

Q Isn't that a part of every elementary course in electrical engineering? *A* I only had a theoretical course, not the application [856] to design of equipment.

Q That is right. Now, I am asking you about the theory of the operation of a transformer, not the practical design, the principles upon which a transformer operates. *A* Well, in a two-winding transformer, as you referred to it, the relation from one to the other is strictly through a magnetic circuit.

[857] *Q* Have you completed your answer? *A* In the auto transformer, the current flows through the entire transformer.

Q Does that affect the principle upon which the transformer operates? *A* I think there is still a magnetic action.

Q Is there any difference in that action between an auto-transformer and a two-winding transformer?

• • • • • •

Trial-Examiner: Do you desire to have the previous question read in order to determine what he means by "that action"? Does the witness desire to have anything further read to explain the question?

The Witness: No. I think the action is similar.

By Mr. Wahrenbrock: *Q* I believe you said a moment ago that

the ordinary auto-transformer consisted of a single coil? [858] *A* Yes.

Q As a matter of fact, isn't that kind of transformer ordinarily made up of two different sizes of wire in the coil? *A* Yes, I believe so.

Q And isn't a lead brought out from the coil at the point of which the size of wire changes? *A* That is the point from where it would be brought out, yes.

Q In other words, you have the equivalent of one coil of wire of one size connected in series with another coil of wire of a different size, with leads brought out from the point at which they are connected in series and from the two opposite ends of each coil? *A* That is correct.

Q Does that complete your answer? *A* Although I believe there are cases where the size of wire in both coils is the same.

Q And as a matter of fact, you could have a two-winding transformer where the size of the wire in each of the two coils is the same as that in the other, could you not? *A* Yes, sir.

Q So that if you take—and I now go back to my original question—if you take an ordinary power transformer which has leads which we will call leads A and B on the primary and leads which we will call C and D on the secondary, and you [859] connect the leads B and C together and you supply electric energy to that apparatus by the leads A and B and you take electric energy from that apparatus by the leads A and D, you have an auto-transformer, have you not?

* * * * * * [861]

The Witness: You have.

By Mr. Wahrenbrock: *Q* And this Exhibit No. 29 for Identification correctly illustrates the diagram to which we have referred throughout our questioning? *A* It does.

* * * * * * [862]

By Mr. Wahrenbrock: *Q* I wish to refer now, Mr. Amberg to the trip the representatives of the Commission made to your com-

pany, to the Bristol substation of the Connecticut Light and Power Company and ask you where in that substation the controls are located by which the oil circuit breakers at Tower 474 of the Connecticut Power Company's 66 KV line, known as the Hartford to Falls Village line are?

* * * * * * [863]

The Witness: They are on a switchboard panel in the substation at Bristol.

By Mr. Wahrenbrock: *Q* How many such controls are there there? *A* As I recall it, there are two.

Q Who owns those controls? [*864*] *A* I don't know.

Q How are they operated? *A* I don't quite understand the question.

Q Who operates them? *A* A switchboard operator, I believe.

Q A switchboard operator employed by the Connecticut Light and Power Company? *A* Yes.

Q What do those controls do? *A* I am not certain as to that.

Q They control the operation of the oil circuit breakers on Tower 474? *A* They do in some form, but I don't know exactly how they function.

Q Well, they open and close those oil circuit breakers? *A* I do not know whether both of them open and close the breakers.

Q Well, together, they open and close, one or the other, or both of the oil circuit breakers on Tower 474? *A* They are used for some switching operations. The exact switching operations, I don't know.

Q And those switching operations are switching operations on what are known as the CP-1 and CP-2 lines? *A* They are.

* * * * * * [868]

Mr. Wahrenbrock: I have no further questions.

Cross Examination by Mr. BRANCH.

* * * * * * [870]

Q As far as you know, Mr. Amberg, has your company ever made changes in an ordinary power transformer such as was suggested by questions of counsel in connection with Exhibit 29,

which I show you, and then used that ordinary power transformer as an auto-transformer?

* * * * * * [871]

The Witness: To my knowledge we have never made such a connection.

* * * * * *

Q And in your opinion, would that be a feasible thing to do as a practical matter?

* * * * * *

The Witness: I don't believe it would be feasible to take an existing transformer and so operate it.

By Mr. Branch: *Q* And you say, as far as you know, that has not been done by your Company? *A* As far as I know.

Q Have you any knowledge of that ever being done anywhere? *A* I never heard of it.

* * * * * * [872]

Redirect Examination by Mr. WAHRENBROCK.

* * * * * * [874]

By Mr. Wahrenbrock: *Q* In your testimony yesterday you referred to a study you had made of the Winsted District. Are you able to fix the time of that study more definitely than you did yesterday? *A* No, but it is several months ago.

Q Since last Christmas?

* * * * * * [878]

The Witness: I believe it was after Christmas.

* * * * * * [880]

AUSTIN D. BARNEY

produced as a witness by the Federal Power Commission, being duly sworn, testified as follows:

Direct Examination by Mr. WAHRENBROCK.

Q Will you state your address, Mr. Barney. *A* My business address is 266 Pearl Street, Hartford, Connecticut. My home address is Farmington, Connecticut.

Q What is your profession? *A* I am an attorney by profession.

Q Do you act as general counsel for the Hartford Electric Light Company? *A* At the present time I am vice-president and general counsel of the Hartford Electric Light Company.

Q Do you act as general counsel for the Connecticut Power Company? *A* At the present time, I am general counsel for the Connecticut Power Company.

Q How long have you acted as counsel for those companies? *A.* In respect to the Hartford Electric Light Company, I came to the company in December, 1924, as counsel, not as general counsel. I became general counsel in February, 1928, and I became vice-president and general counsel in 1936. I don't recollect just when I became counsel or general counsel for the Connecticut Power Company, but it runs back [*881*] over a period of eight or ten years. I forgot to check that.

Q And certainly since August of 1935? *A* Yes, sir.

Q And including August of 1935? *A* Yes.

Q Have you appeared upon behalf of the Connecticut Power Company and the Hartford Electric Light Company in response to a subpoena duces tecum which was served upon those companies and Mr. Ferguson?

* * * * * * [895]

By Mr. Wahrenbrock: *Q* I show you several photostatic copies and originals and I had a set of photostat copies to Respondent's Counsel, and I hand another set of photostat copies to the Examiner—

Mr. Branch: (Interrupting) How many papers are there here?

By Mr. Wahrenbrock: *Q* (Continuing) —and I call your attention to the original of the letterhead of the Connecticut Power Company, dated November 8th, 1937, being a letter of two pages, and I ask you if you recognize the original and the signature thereto.

Mr. Branch: Excuse me—have we more than one copy of the same thing, or is it just one? I have eight or ten sheets which you handed me.

Mr. Wahrenbrock: One copy of each item, I believe.

The Witness: That is my signature.

By Mr. Wahrenbrock: *Q* And that is an original letter in the files and is a letter which you wrote under date of November 8th to the Commission? *A* Yes.

Q And following that letter are five pages of tabulations, and I ask you if those are the tabulations which are included with the original letter which you sent?

Trial Examiner: Do those tabulations all appear in the [*896*] copies we have?

Mr. Wahrenbrock: Only the first two pages appear in the copies.

Mr. Branch: How are these headed? I am finding it a little difficult to follow you?

Mr. Wahrenbrock: The first page is headed, "Report on sale of Electric Energy",—

Mr. Branch: (Interrupting) That is enough. I have that.

Mr. Wahrenbrock: The second one begins the words "Demand and Energy Charge"?

Mr. Branch: Thank you.

By Mr. Wahrenbrock: *Q* Do you recognize the originals to which I have referred, in the Commission's files, as the enclosure with the letter which you have previously identified? *A* Yes, I presume those are the originals. The letter did have some tabulations. Without a detailed checkback, I could not say, but I do not question that they are the ones.

Q I call your attention to the original letter in the files dated September 10, 1937, on the letterhead of the Connecticut Power Company, and ask you if you recognize that two-page letter which contains what purports to be your signature contained thereon? [*897*] *A* That is my signature.

Q That is your signature and that is the letter which you sent under that date to the Commission? *A* Yes.

Q I call your attention to a carbon copy which appears in the second file dated June 28th, 1937, of a letter addressed to the

Connecticut Power Company, over the signature of Leon M. Fuquay, and ask you if that carbon copy is a copy of a letter which was received by the Connecticut Power Company? *A* What was the date of that letter?

Q June 28th, 1937. *A* I think it is.

Mr. Wahrenbrock: Mr. Examiner, these photostats are photostats of the three letters and the two pages of enclosures to one letter which has just been identified by the witness.

Trial Examiner: Does counsel desire to offer this as one or as three exhibits?

Mr. Wahrenbrock: As one. To be identified as Exhibit 30.

Trial Examiner: Do they all deal with the same subject matter?

Mr. Wahrenbrock: Yes.

Trial Examiner: Will you state so that we can have a clear picture of just what they are, in describing the exhibit, which this is portions of the correspondence dealing with?

Mr. Wahrenbrock: Portions of correspondence dealing with [898] the filing as rate schedules, by the Connecticut Power Company, of the contracts between the companies, referred to in the letters.

Trial Examiner: Will you make that just a little more clear and say just what companies?

Mr. Wahrenbrock: The Hartford Electric Light Company, the Connecticut Light and Power Company, and the Torrington Electric Light Company.

Trial Examiner: You have asked that they be marked for identification?

Mr. Wahrenbrock: I thought I did.

Trial Examiner: And I have not ruled on that point yet.

Mr. Wahrenbrock: May they be identified as Exhibit 30?

Trial Examiner: The reporter will mark them as Exhibit 30, for Identification.

(Documents referred to are marked Exhibit Number 30 for Identification.)

Mr. Wahrenbrock: I offer them in evidence as Exhibit 30, those marked Exhibit 30 for Identification.

Trial Examiner: Is there any objection?

Mr. Branch: May I confer with my associates?

Trial Examiner: You may. And meanwhile I suggest that these other copies be stapled.

Mr. Branch: I wish to make it clear that nothing that I say is intended to be in the nature of any criticism on the [899] ground that these are copies. I want that understood and I am merely asking for information as to the purpose for which they are offered.

Trial Examiner: Will you state the purpose, Mr. Wahrenbrock?

Mr. Wahrenbrock: These are to lay the basis for the proof of contracts under which electric energy is sold by means of facilities owned or operated by the respondent for the transmission of electric energy in interstate commerce.

Mr. Branch: I am afraid that leaves me just about as much in the dark as I was before. Do you offer them as proof of the statements that are made in them by the writers of the letters, or what?

Trial Examiner: Will counsel for the Commission answer the question of Respondent's Counsel?

Mr. Wahrenbrock: I am not sure that I understand the question, Mr. Examiner.

Trial Examiner: Will you restate that so that Commission Counsel can understand it?

Mr. Branch: I am looking for information as to the purpose for which they are offered. The previous explanation leaves me still in the dark and I want to know whether they are introduced as evidence of the statements that are contained in the letters, or what they are evidence of, and for what specific purpose.

[900] Mr. Wahrenbrock: They show the filing by the Connecticut Power Company of certain power contracts, in response to a request from the Federal Power Commission. They are offered to show those filings.

Trial Examiner: And as part of a general purpose, as you stated a while ago? Do you mean that the proof of that filing is part of that general purpose?

Mr. Wahrenbrock: Yes.

Mr. Branch: I am not inclined to object to them on my understanding of the statement of counsel.

Trial Examiner: All right. They will be admitted as Exhibit 30.

(Exhibit Number 30 for Identification was marked Exhibit 30 in Evidence.)

By Mr. Wahrenbrock: *Q* I direct your attention, Mr. Barney, to the letter of September 10th, 1937, written by you, which is a part of Exhibit 30, and to the third paragraph of that letter in which you say, "It may be true that some of the energy delivered by the Connecticut Power Company to the Hartford Electric Light Company or to the Connecticut Light and Power Company and the Torrington Electric Light Company may at times have interstate origin, by virtue of the operation of the Connecticut Valley Power Exchange."

Mr. Branch: You don't care to read the rest of the [*901*] paragraph?

Mr. Wahrenbrock: It is in evidence and can be read by anybody who sees the exhibit.

By Mr. Wahrenbrock: *Q* I ask you if you are still of that opinion?

Mr. Branch: I object. I have a very high regard for Mr. Barney's capabilities in many lines. I did not realize that you were calling him as an engineer. If you are calling him as a lawyer, I am sure he is well qualified, as he is also in the other duties he has had to perform, but it seems to me that for you to try to prove your case by getting a lawyer to do it is rather unusual. I don't know what Mr. Barney's opinion is going to be on this.

Trial Examiner: I am inclined to agree with counsel that no groundwork has been laid as to the qualifications of this witness to pass upon the question.

By Mr. Wahrenbrock: *Q* Did that statement represent the position of the Hartford Electric Light Company at the time the letter was written?

Mr. Branch: The same objection.

Trial Examiner: Of course, that is as to the position of the Company and is not necessarily an engineering question.

Mr. Branch: I think that is true. I don't think we are going to get very far on this anyway, but it does seem to me [*902*] strange that the Federal Power Commission has to try to prove its case from what somebody else, whose identity is not disclosed, may think about the thing.

Trial Examiner: We will admit the last question and the possible answer, for whatever they may be worth. I am not in the position of a jury here, and the evidence can be weighed as to its materiality afterwards.

Mr. Branch: I am not at all afraid that your mind is going to be poisoned by Mr. Barney.

Trial Examiner: You may answer the question.

The Witness: That statement in the letter was made and is in the nature of an assumption or a possibility, in reply to a letter from the Federal Power Commission, dated June 28th, in which, I think, that they suggested the possibility of out-of-the-State energy reaching Bristol and Torrington. I personally don't know whether any such energy does do that. The rest of the paragraph points out that as far as the contracts were concerned, they had no reference to out-of-the-State energy. The statement cannot be construed as a statement of fact or a statement of opinion that in fact any energy did so flow.

By Mr. Wahrenbrock: *Q* That statement did represent the position of the Hartford Electric Light Company in response to the questions put by the Federal Power Commission in the letter to which you [*903*] have referred?

Mr. Branch: I think it would be fairer if he is stating the position of the Hartford Company, that you should not confine it to one very qualified sentence in the letter, but to the whole letter.

Trial Examiner: I think that is true.

The Witness: Mr. Examiner, may I correct the record at this point, because I think there is some confusion?

When you are speaking of the Hartford Company, don't you really mean the Connecticut Power Company, because this all refers to the Connecticut Power Company and not to the Hartford Electric Light Company?

Trial Examiner: Yes, I think that is what he means, because I believe the witness could not be expected to know what represented the opinion of the Hartford Company in the same way.

Mr. Wahrenbrock: I will change the question then, Mr. Examiner.

By Mr. Wahrenbrock: *Q* I will ask you, Mr. Barney, if this letter including the paragraph to which I have referred, and referring to that paragraph in particular, represented the position of the Connecticut Power Company at that time?

Mr. Branch: I think it is understood that I have an objection going to this entire line of questions, as being im- [*904*] material and incompetent? Mr. Barney, being a lawyer, knows that when I say "Incompetent", I am speaking about the opinion of the Company and not his own opinion.

Trial Examiner: It is so understood.

A It represented the opinion of the General Counsel of the Connecticut Power Company, to which the letter of June 28th was referred, and the opinion of the General Counsel was that even assuming there was some such energy, what of it? Because the contract did not have anything to do with any out-of-the-State energy.

Trial Examiner: Will you speak just a little louder?

The Witness: In so much as the matter of opinion has been opened up, I would like to say that so far as my information and knowledge is concerned, the Connecticut Power Company never has admitted that these contracts that were filed were interstate contracts or that there was any necessity for filing them. They

were filed at the conference with the members of the Power Commission in Washington, purely as a matter of courtesy and nothing else.

By Mr. Wahrenbrock: *Q* You wrote this letter in response to the Commission's letter of June 28th, which is a part of this same exhibit? *A* Yes, sir.

Q You wrote this letter on behalf of the Connecticut Power Company? [*905*] *A* Yes.

Q And you spoke for the Connecticut Power Company? *A* Yes.

Q And you knew what you said there? *A* Yes, sir.

Q The letter was written after due consideration upon behalf of the Company? *A* Yes, sir.

Q And you took into account the Company's knowledge of all the facts? *A* Took into consideration the knowledge of all of the facts the General Counsel had, or was able to obtain upon consultation with others.

[*906*] *Q* From consultation with whom? *A* With the officers of the company.

Q Has the position of the Connecticut Power Comj any changed since that date, in that respect? *A* Well, could you specify a little more in detail what you mean?

Q Is the statement of the position of the Connecticut Power Company made in this letter of September 10th, and directing your attention particularly to the first sentence of the third paragraph of that letter, which I previously read, is that position a position which has been consistently maintained by the company?

Mr. Branch: I think it should refer to the position in the entire letter, from which that is taken. By itself it is hardly an adequate expression.

Trial Examiner: I think that if the answer is in the affirmative it will cover the sentence as well as the rest of the letter.

The Witness: So far as I know—

Mr. Branch: Excuse me. I understand my objection goes to this entire line of inquiry.

Trial Examiner: Your objection to the entire line is overruled. You may answer.

The Witness: So far as I know, I can only speak for the [907] opinion of the general counsel, and that is, the position of the Connecticut Power Company has not changed in respect to that entire letter, including the sentence you refer to.

By Mr. Wahrenbrock: *Q* You can also speak as an officer of the company, can you not? *A* Not as the Connecticut Power Company, no.

Q Does the position of the Hartford Electric Light Company differ from that of the Connecticut Power Company with respect to the matters touched on in this letter?

Mr. Branch: Same objection. That is one step further.

Trial Examiner: I believe the Hartford is a party to the contract, and the witness is himself an officer and vice-president of the Hartford Company. I will permit the question to be answered.

The Witness: Well, there is nothing in the business of the Hartford Electric Light Company that is involved in that letter, so far as I can see. This letter does not express any opinion in respect to the position of the Hartford Electric Light Company.

By Mr. Wahrenbrock: *Q* Have any of the officers of the Connecticut Light and Power Company, or representatives or attorneys of that company, ever expressed to you their disagreement with the position expressed in this letter of September 10, 1937?

[908] Mr. Branch: I object to it. It is clearly incompetent.

Trial Examiner: I think that is negative evidence, and it is not admitted.

Mr. Wahrenbrock: May I be heard on that, Mr. Examiner?

Trial Examiner: You may.

Mr. Wahrenbrock: The question is raised by the show cause order as to whether the respondent has wilfully and knowingly violated any of the requirements which have been imposed upon it by the Commission. There may be some room for argument as to how much subjective intent enters into the question of wilfully and knowingly violating those requirements. Anticipating some such

argument, I propose to show certain facts about the subjective intent of the responsible officers of the respondent. Subjective intent is necessarily a little bit elusive to get at. A certain amount of negative evidence is necessary, in the absence of anything else to show what goes on in men's minds.

Trial Examiner: I will say for counsel here, this is not a matter, however, in which he is dealing with a question of the negative of the respondent. Counsel might ask the witness what the Hartford Company said or did, but not what they did not. You are asking here a question as to negative action on the part of a third party, and it will not be permitted.

[*909*] Mr. Wahrenbrock: The record will show, if it does not already show, that the Connecticut Power Company and the Connecticut Light and Power Company have contractual relationships under which they exchange electric energy which is supplied to the Connecticut Light and Power Company from the Connecticut Power Company's 66,000 volt line from Hartford to—

Mr. Branch: Will you specify the contract or arrangement by which the Connecticut Light and Power Company supplies any energy to that line? It is new to me. If it is so, I have never heard of it.

Mr Wahrenbrock: By which the Connecticut Light and Power—

Mr. Branch: No, the respondent here supplies any energy to that line. You said they exchanged energy, which to my mind meant that if you exchange, each party gives something.

Mr. Wahrenbrock: If I said "exchange energy", I misspoke myself. I do not mean to say exchange energy. I mean to say the Connecticut Light and Power Company receives energy from the Connecticut Power Company.

Mr. Branch: That is quite a different proposition.

Mr. Wahrenbrock: That is a proper correction and I am glad to have it made. And that at one time the Connecticut Light and Power Company was a member of the Connecticut Valley Power Exchange, [*910*] and at that time did exchange energy by means

of some of the same facilities that are involved. The operations and the actions taken by these several companies at the time the Public Utility Act of 1935 was enacted were in some measure and to some extent, as shall be shown, taken in concert. I expect to probe as to what extent these attitudes were similar, and to what extent they resulted in concerted action, as indicative of the intent with which the parties had done the things they have done. That is, the respondent has done.

Trial Examiner: If you afterwards lay such a groundwork, then the question may be admissible. It is not in the present state of the record admissible in its negative form.

Mr. Wahrenbrock: May I have the question read to ascertain whether it says what I think it does?

Trial Examiner: You may. Will the reporter read the question.

(Whereupon the last question as above recorded, was read by the reporter.)

Mr. Wahrenbrock: I call the examiner's attention, if you please, to the fact I do not ask whether they have failed to do something. I have asked whether they have ever expressed disagreement; whether they have ever actually positively expressed disagreement.

Trial Examiner: Couldn't counsel ask the question [*911*] if they agreed with it?

Mr. Wahrenbrock: I will be glad to ask that next.

Trial Examiner: It seems to me that would be more in line with positive evidence, or as a general question as to what they did believe.

By Mr. Wahrenbrock: *Q* Have any representatives or employees or officers of the Connecticut Light and Power Company ever expressed to you their agreement with the position taken in the letter of September 10th, to which we have been referring, and referring particularly to the first sentence in the third paragraph of that letter? *A* Well, so far as I can know, I don't think any of the officers or lawyers of the Connecticut Light and Power Company knew of the existence of this letter of September 10,

1937, prior to this proceeding. Now, that is only my belief. So far as anything I have done, I don't think they did.

Q Yes. Now, I didn't ask you whether they knew about the letter, or whether the letter had been called to their attention. I asked you whether they expressed to you, or you had heard them express the position as expressed in the letter.

Mr. Branch: I think that is altogether too broad, and I object to it on that ground.

Trial Examiner: I will allow the question. You may answer the question. [*912*] Note an exception for Mr. Branch.

The Witness: That is a difficult question to answer, because I am not quite sure what you mean by position, therefore, I will have to answer it according to my understanding. In respect to the claim or position that the contracts referred to in the letter were entirely intrastate contracts. I believe that the counsel and officers of the Connecticut Light and Power Company are in entire agreement. I don't recollect any specific conversation relative to the matter, or relative to the specific contracts. There has been over a period of time discussions, not formal—in the manner that occur when two or more attorneys get together, as to the whole situation, relative to the Connecticut Light and Power Company, the Hartford Electric Light Company, or any other cases that might have come to the attention of counsel. Therefore, I cannot say, except from my impression as to any definite specific statement as to agreement by the officers of the Connecticut Light and Power Company. In respect to the first sentence in the third paragraph of the letter September 10th, again I would like to repeat that that is not a statement of a position other than a possibility, that energy, out of State energy, might flow over those lines. As to that matter, I have heard a great many engineers and lawyers argue pro and con. I do not, I cannot say as to the position of the officers [*913*] of the Connecticut Light and Power Company on that particular point from any direct inquiry on my part.

Q Mr. Barney, isn't it true, or is it true, that in informal conversations with the officers and attorneys of the Connecticut Light and Power Company, they have admitted the possibility of Massachusetts energy being on the CP-1 and CP-2 lines at times? *A* I was trying to recollect any specific times, even up to this noon. I should say in answer to that that there probably—in the way that you put it, they have considered that possibility. If you ask me for a specific time and date, I couldn't give them to you.

* * * * * * [*918*]

By Mr. Wahrenbrock: *Q* I will show you, Mr. Barney, a one-sheet document which has been designated by the Commission's staff "The Connecticut Power Company, Rate Schedule FPC-5," and ask you if with the exception of the designation and the stamp, that is the document which was filed by your letter of November 8th which is a part of Exhibit 30 for Identification.

* * * * * * [*920*]

The Witness: It is.

By Mr. Wahrenbrock: *Q* Referring further to Exhibit 31, I will ask you what is the contract under which electric energy is sold by the Connecticut Power Company to the Torrington Electric Light Company at the terms specified in that exhibit?

* * * * * * [*921*]

The Witness: At the present time, and also I believe at the time that Exhibit 31 was filed, that is, November 9, 1937, Torrington was being served under more or less of an oral arrangement at a rate or billing price mutually agreeable to the two parties. My recollection is that was the arrangement on November 9th, 1937, and I think it still continues. I cannot say that the billing price is exactly the same. My recollection is that originally there was an old contract which I think goes back to 1912, which from time to time has been varied by letter and by oral action of the parties, so that in the opinion of counsel for the Company, the Connecticut Power Company, it is very doubtful if there is any written contract in existence that either party could stand on.

* * * * * * [922]

By Mr. Wahrenbrock: *Q* Are the terms set forth in Exhibit 31 the terms under which electric energy has been sold to the Torrington Electric Light Company since that rate schedule was filed with the Commission? *A* Have the terms been changed?

Q Are they the same terms? *A* I cannot personally answer that. I would have to check it. As far as I know, there is no written or any other contract. The arrangement is the same, but the billing may have been changed.

Q At the time you filed that rate schedule, Exhibit 31, were there any terms of the effective agreement, between the Connecticut Power Company and the Torrington Company with respect to power factor? *A* That I could not say without getting other people to tell me about it. If you are referring to that old agreement, in so far as counsel is concerned, there was never any reference to that old contract that ever came across counsel's desk, in [923] so far as any dealings with the Torrington Electric Light Company are concerned. Whether or not under the arrangement continuing over a period of years, power factor was part of the billing, I cannot say; I would have to ask somebody else.

Q And do you know what the delivery point for the delivery of electric energy by the Connecticut Power Company to the Torrington Electric Light Company, under the terms of that agreement, that effective agreement, as of the date of the filing of Exhibit 31 as the rate schedule was? *A* No, not from my personal knowledge or recollection.

Q Mr. Barney, could you make available to me for inspection the original contract which you have referred to as possibly in 1912, and such letters or correspondence as relate to any modification or change in the terms of that contract, and any memorandum of oral understandings with respect to the terms of that contract? *A* Well, Mr. Examiner, there is a whole lot of things that are not pertinent, at least in my opinion, to this particular matter. I don't know just how far we can go, and I would like

to say that it is not the Federal Power Commission's counsel that bother us, any more than the counsel for the Connecticut Light and Power Company. In my opinion, there is nothing in the old Torrington contract, and it is a file that is about six inches or more thick, that is related to this [*924*] particular matter, and there is a lot of miscellaneous correspondence in it that has absolutely nothing to do with the Connecticut Light and Power Company or interstate transactions, or anything else. I am just raising the question because there is no limit to what you can produce or can be asked for, and I rather object to going too far in this matter.

* * * * * * [*925*]

The Witness: It has been our opinion, and I state it here again, that the 1912 contract has not been in effect for some time because it has been subject to so many changes since 1912, that long before I had anything to do with it, it was really out of the window as a legal agreement.

* * * * * * [*929*]

Mr. Wahrenbrock: Mr. Examiner, I now show to counsel for the respondent four documents which have been supplied to me by Mr. Barney, in response to the subpoena that was served upon the Hartford & Connecticut Power Company and Mr. Ferguson, which I propose to have identified separately.

Mr. Branch: I don't know whether this is the appropriate time for me to do so or not, but I do want to do this at the earliest possible moment. This brings us to a matter which is of some importance, particularly in view of the scope of the subpoena duces tecum which was served not only on Mr. Barney but on us. The subpoena which was served upon us, for instance, directs us, among other things, to produce all legal opinions [*930*] relating to eight specified matters—the terms are very large. I take the words "discussions", or directly relating or concerning any of the following—applies to "legal opinions". And then there is another provision which includes all bills rendered, and all journal

entries for expenditures incurred for legal services in relation to or involving the determination of the applicability of any provision of the Public Utility Act of 1935, and so forth and so forth.

Mr. Barney's subpoena, I am advised, was rather broad in scope, and it was definitely under this that he gave Mr. Wahrenbrock the documents in question. I don't recall that I have ever been in a proceeding where it was sought by a subpoena duces tecum to require legal opinions and other communications between attorney and client, or bills rendered for legal services to be produced. The implication of such request is pretty obvious.

If we are to go into all those matters, it seems to me that we are going to have a mass of legal opinions and discussions as to the correctness of legal opinions, the facts upon which they were based, the incorrectness or correctness of assumptions made in them, and a great variety of other things. We will prolong this hearing tremendously, and it seems to me improper, if we go into these matters. I certainly don't recall ever having anybody suggest it was proper to obtain in such a proceeding lawyers' bills or amounts in- [*931*] curred for expenditures.

I wish to raise, in behalf of the Connecticut Light and Power Company, and I think Mr. Barney will—I understand in so far as is necessary, he will support me in raising on behalf of the Hartford Electric Light Company and the Connecticut Power Company, and any other individuals connected with those companies in any connection, and also in connection with the individuals connected with the Connecticut Light and Power Company, the question of privilege between attorney and client.

That privilege is, of course, very broad. I assert it, and it seems to me perfectly clear that this would prevent any use whatever in any connection with each of these documents which have been offered to me.

There is one here that doesn't seem to be identified, whether it came from an attorney or was sent to an attorney as such, I don't know, so my statement as to that is not as positive as it might be. We might have to find out. The other three are clearly com-

munications between attorney and client, and come within the clearest possible scope of privilege. I therefore raise the objection to any use of these documents on that ground.

I don't know—I am rather surprised that counsel for the Federal Power Commission should undertake in this way to get opinions of counsel, and I certainly find neither in the Act nor in any authorities any justification for making use [*932*] of material in this way. The matter seems to me so obvious that it seems unnecessary to cite authorities or anything of that kind. If the Examiner is in any doubt, I should like the opportunity to prepare and submit a memorandum.

Trial Examiner: I should like counsel to prepare a memorandum on that subject and I also will allow you some opportunity to examine and see whether they do constitute a matter of privilege or not. I have to have some preliminary knowledge.

Mr. Branch: I also want to suggest that this matter of immateriality—

Mr. Wahrenbrock: May they be identified so that we know what we are talking about?

Trial Examiner: They may be marked for identification.

Mr. Branch: They will just be marked for identification, subject to my objection. I felt it was incumbent to raise my objection at the earliest possible moment. My objection is to any further use other than merely having some numbers put on them, and I take it that I am not waiving—

Trial Examiner: Questions in connection with these documents will not be asked at the present time.

Mr. Branch: I understand the Examiner rules that by not making any further objections to just marking them, I am not waiving my—

Trial Examiner: You are waiving nothing in that respect, [*933*] and I say I would like to have you prepare a short memorandum on that before tomorrow morning, if you can.

Mr. Wahrenbrock: Mr. Examiner, at the proper time, I would

like to be heard on the subject, but I would like to get them identified first.

* * * * * * *

(The documents referred to were marked as Exhibit Nos. 32, 33, 34 and 35 for identification.)

* * * * * * [936]

By Mr. Wahrenbrock: *Q* Can you explain what this Exhibit 35 for Identification is? *A* That is a statement of the savings, or the amount—the Connecticut Light and Power Company's share of the savings paid to it for the twelve months ending August, 1935, during which time it was as I remember, a member of the Connecticut Valley Power Exchange, I believe, and was prepared at my request by Mr. Mayott, in response to Item 2 of the subpoena.

* * * * * * [941]

Cross Examination by Mr. BRANCH.

Q Mr. Barney, some reference has been made to the fact that the Connecticut Power Company filed certain letters and certain contracts with the Federal Power Commission, and there have also been questions as to the attitude of the Connecticut Power Company on certain matters. As far as you know, has the Connecticut Power Company ever taken the position with the Federal Power Commission that it was subject, or is subject to the jurisdiction of that Commission, which extends to companies which are designated as public utilities under part 2 [942] of the Act. *A* In connection with the filing of the contracts that have heretofore been mentioned in the testimony, those contracts were filed more or less as a matter of courtesy and accommodation and request of the Federal Power Commission, after a conference held in Washington. It is true that they were filed, but in so far as the Connecticut Power Company is concerned, it has never filed them under what I think was Order No. 44, of the Federal Power Commission, relative to the filing of wholesale contracts, involving interstate transactions. I am not sure that is the proper reference, but I think that is the correct order.

Q Now, I will ask you a somewhat wider question. Has the Connecticut Power Company ever admitted or stated to the Federal Power Commission or its representatives that it is subject to that jurisdiction of the Federal Power Commission which is dependent upon being a public utility as defined in part 2 of the Act? *A* The Connecticut Power Company has conformed with the accounting order, and has set up its accounts in accordance with the prescribed classification by the Federal Power Commission and also has made the readjustments, or the original cost studies thereunder required. It hasn't to date had an argument as to jurisdiction with the Federal Power Commission, because it did comply. As owner of the Agawam [943] transmission line, it was the opinion of counsel that it would be rather difficult to deny jurisdiction as a public utility on that account.

Q Has it ever admitted that the contract—that the contracts with the Torrington Electric Light Company, or the contracts with the Connecticut Light and Power Company, are contracts involving interstate commerce? *A* Not so far as I know. The correspondence introduced with some other correspondence has never admitted that those were interstate contracts, as far as I know.

Q Now, Mr. Wahrenbrock has asked you some questions in regard to your letter to Mr. Fuquay's attention, directed to the Federal Power Commission, dated September 10, 1937, which is—

Mr. Branch: Can you enlighten me as to the number of that exhibit?

Mr. Wahrenbrock: I think it is Exhibit No. 30 for identification.

Mr. Branch: Isn't it in evidence?

Mr. Wahrenbrock: This is my copy.

Mr. Branch: No. 30; whether it is 30 for identification or Exhibit 30, makes no difference now. I will refer to it simply as Exhibit 30.

By Mr. Branch: *Q* In that letter you state that the Connecticut Power [944] Company has a steam station in this section of its

territory, and the Hartford Electric Light Company has always furnished it with its requirements. Continuing, I read, "The Connecticut Power Company has to obtain sufficient steam capacity for supplying its load on its interconnected system from someone, and has always obtained it within the State of Connecticut." Is that statement correct as of all times since August, 1935, with the exception possibly of brief periods during an emergency—or, I will leave out "during emergency". Is that correct as of all times since August 26, 1935? *A* So far as I know, it is.

Q I continue to read. "It"—referring obviously to the Connecticut Power Company—"never has had any contracts, oral or written, for firm capacity outside of the State of Connecticut." Is that correct as of all times since August 26, 1935? *A* May I first correct my answer to the prior question. There was a period during the flood of March, 1936, where—I can't say without going to other sources as to where any emergency was supplied from, or capacity. With the exception of the emergency flood, my answer is correct.

Q Now, I think there is a question pending.

Mr. Branch: Will you read it, please.

Trial Examiner: The reporter will read the question.

[945] (Whereupon the last question as above recorded, was read by the reporter.)

A So far as I have any knowledge, it is correct.

Q You are familiar with the important contracts of the Connecticut Power Company, as general counsel, are you not, Mr. Barney? *A* I am unless they have been holding out on me.

Q Unless what? *A* Unless they have been holding out on me.

Q And any contract for firm capacity would be an important contract about which it would be your duty to be familiar, would it not? *A* Well, let me say it should. I am not an officer of the company.

Q Now, I read to you from this paragraph in the same letter. Have you a copy of this before you? *A* Yes, sir.

Q "It may be true that some of the energy delivered by The Connecticut Power Company to The Hartford Electric Light Company or to the Connecticut Light and Power Company and The Torrington Electric Light Company may at times have interstate origin by virtue of the operation of the Connecticut Valley Power Exchange." I will ask you whether that particular sentence was written with particular reference to a letter from the Federal [946] Power Commission to you—there is some reference in this letter—there is reference to a letter of September 7th. *A* The letter of June 28, 1937.

Mr. Branch: I am sorry Mr. Davis isn't here.

By Mr. Branch: *Q* Have you before you that letter of June 28, 1937? *A* Yes.

Q Was that sentence written in the letter written with particular reference to some statement by the acting secretary of the Federal Power Commission in a letter dated June 28, 1937? *A* The letter of September 10th, which I believe is the letter counsel is speaking of, to the Federal Power Commission, was written in response to the letter of June 28th, from the Federal Power Commission, and signed by Mr. Fuquay, the acting secretary. In the letter of June 28th from the Federal Power Commission, it was suggested that energy delivered to the Connecticut Light and Power Company under the agreement dated December 16, 1936, and to the Torrington Electric Light Company, may in part at least, be derived from sources outside the State. It was in response of that statement that the language in the letter of September 10th appeared.

Q In making that statement, did you mean to admit that energy delivered by the Connecticut Power Company to the [947] Connecticut Light and Power Company, and the Torrington Company, did actually have interstate origin?

Mr. Wahrenbrock: Mr. Examiner, I think the letter speaks for itself in that respect.

Mr. Branch: He has asked him questions concerning his posi-

tion, and I want to state his position in regard to this, and I think it is proper cross-examination.

Mr. Wahrenbrock: My questions, which were vigorously objected to, went to the maintenance of the position as stated in the letter subsequently, and the position of the Connecticut Light and Power Company with reference to that position of the Connecticut Power Company. I didn't attempt to step outside and divorce from the record the question of the position as stated in the letter.

Trial Examiner: I think that the question is admissible. The objection is overruled.

The Witness: There was no intention of admitting the claim of the Federal Power Commission, even as the letter states—even if it was true, and certainly the writer didn't know as a fact, if it was true or not, the contracts were still all intrastate contracts, as stated in the letter of September 10th. That was the position of the Connecticut Power Company.

[948] *Q* Has it been the position of yourself and of the Connecticut Power Company at all times that there is no contractual relationship between the operation of the Exchange and the intrastate companies in Connecticut, and there is nothing in the specific contracts to which the Federal Power Commission has referred as being the contracts relating to Torrington, and with the Connecticut Power and Light Company for its supply at Bristol, which creates any interstate obligations, whether as to sale or transmission?

Mr. Branch: That is a pretty long question, and maybe I had better have it read back.

Mr. Wahrenbrock: I should like to have it repeated also.

(The question is read.)

Mr. Wahrenbrock: Mr. Examiner, I object to that question as being scarcely susceptible of interpretation as to what an interstate obligation is.

Mr. Branch: That is the language in the letter which Mr. Wahrenbrock introduced in evidence.

Trial Examiner: I think in view of that fact, we will allow the question, if the witness understands it.

The Witness: Trying to avoid conclusions of law as to the interpretations of contracts, I can say that the contracts between the Connecticut Power Company and the Connecticut Light and Power Company for service at Torrington and Bristol are firm power contracts. The Connecticut Power Company has a firm [949] primary power contract with the Hartford Electric Light Company covering all of its requirements, including Torrington. It also has another contract with the Hartford Electric Light Company—a primary power contract—covering The Connecticut Power Company's obligations to Connecticut Light and Power Company at Bristol. The Connecticut Power Company is also a member of the Connecticut Valley Power Exchange. There is nothing in the Exchange agreement or in its operations, so far as I am familiar with them, that in any way concerns the firm primary power.

By Mr. Branch: *Q* And now, to supplement that question, this letter contains this sentence, "The Exchange agreement, so-called, involves only surplus power, when and if available, and is in reality, merely a voluntary operating plan subject to termination at the will of any of the participating parties, and is not in any sense a contract." Is that a correct statement of the situation as you understand it? *A* As I understand it, that is the situation.

Q Has that been so at all times since August 26th, 1935? *A* Subject to the interruption of the great flood in 1936, and the emergency period which extended over quite a period of time, as I recollect. Subject to that period of time, that is correct.

[950] *Q* Even during that period—I don't suppose you meant that during that period of time it became anything other than a voluntary plan? *A* Excepting that period of time, which as far as I know, there was not Exchange operations under the agreement. It was all emergency exchange.

Q What you mean is that there were not any operations under the agreement during that time, not that the nature of the Exchange agreement was modified at that time? *A* The old Exchange was terminated on August 24th, as I recollect.

Q Is that correct, Mr. Barney, that during the emergency, you mean, that that did not operate—the exchange did not operate? *A* Not on Exchange basis. I would have to refresh my recollection of what the status was, but as I remember there was not any permanent Exchange as had existed before and which existed under new membership after the emergency period. It was an emergency exchange—that is all that happened.

Q And in this letter you also say:

> "The very nature of Exchange transactions are such that no firm power contract could be based thereon."

Was that true as of September 10th, 1937? *A* According to my understanding, that is correct.

Q And has that also been true at all times since August [*951*] 25th, 1936? *A* Again excepting that emergency period, I think it is correct.

Q Now, in this letter you also say—I call your attention to the first full paragraph at the top of page 2, Mr. Barney—the first sentence reads:

> "As to filing any monthly reports on Form IT-1, the same difficulties arise, except more so, as were found in reporting the exchange transactions on this form."

Now, this is the sentence to which I wish to direct your attention:

> "There being no direct transactions between companies, in respect to any interstate energy, it is impossible to use that form."

Is it true that there were no direct transactions between either the Connecticut Power Company on the one hand, or the Connecticut Light and Power Company and the Torrington Company on the other hand, with respect to any interstate energy?

Mr. Wahrenbrock: Mr. Examiner, I object to that question, unless it is specified whether the transactions refer to contractual relationships or actual delivery of energy.

Trial Examiner: I think the point is well taken.

Mr. Branch: My exception may be noted; I will reframe the question.

[952] By Mr. Branch: *Q* Were there any transactions between the Connecticut Power Company on the one hand and either the Connecticut Light and Power Company or the Torrington Company on the other hand which called for delivery of any energy which was generated outside of Connecticut? *A* May I have that question repeated?

Trial Examiner: I think the objection was to the use of the word "transaction" without further explanation.

Mr. Wahrenbrock: I ask that in that question as so framed, the meaning of "called for" be made definite.

Trial Examiner: The reporter will repeat the question.

(The question is repeated.)

Mr. Branch: I should have said, "Were there any arrangements?"

Mr. Wahrenbrock: That is subject to the same criticism.

Trial Examiner: Do you mean arrangements in the sense of agreements?

Mr. Branch: Agreements or understandings.

Trial Examiner: Does that answer your objection?

Mr. Wahrenbrock: If the question is: Was there any contractual obligation to deliver power from outside of the State, that is one thing. If that is what the question is meant to ask, it can be so stated. If it is a question whether the energy delivered originated outside of the State, that is [953] another thing, and if that is the answer to the question that is called for, that can be so stated.

Trial Examiner: He has worded it now in such a way as to make it "understandings or agreements", which would not involve the question of where the energy actually originated.

Mr. Wahrenbrock: Yes, but he has not cured the ambiguity of the phrase which he used, which is "called for". If he is going to judge what was done by what actually happened, that is, that

energy from outside of the State was actually delivered, that is one thing. If he is asking whether the contractual requirement was that it be extra-State energy, that is another thing.

Trial Examiner: I understood counsel to mean by "called for", "provides for".

Mr. Branch: Yes, sir.

Mr. Wahrenbrock: With that understanding, the question is more definite.

Mr. Branch: Perhaps I had better reframe it.

By Mr. Branch: *Q* Mr. Barney, as far as you know, has there at any time since August 25, 1936, been any contract, arrangement or understanding providing that any energy originating outside of the State of Connecticut be delivered either to the Torrington Electric Light Company or to the Connecticut Light and Power Company, by your Company, the Connecticut Power Company?

[954] Mr. Wahrenbrock: That was a rather long question, Mr. Examiner, and of considerable interest to me, and I ask that it be read back, please.

Trial Examiner: The question will be read back for the benefit of Commission Counsel.

(The question is repeated by the reporter.)

The Witness: All I can say in answer to that is that there were no agreements, written or oral, to the best of my knowledge, between the Connecticut Power Company and the Connecticut Light and Power Company which in any way provided for delivery of out-of-the-State energy to the Connecticut Light and Power Company either at Bristol or Torrington.

By Mr. Branch: *Q* I understand your answer would also apply to agreements or understandings, written or oral, between the Connecticut Power Company and the Torrington Electric Light Company, would it not? *A* Yes, it would be the same answer.

Q It was a rather long question and I wanted to be sure that your answer related to the entire question.

Trial Examiner: May I inquire at this time of counsel whether

he will find it necessary to get away before 5:00 o'clock, or whether he has made arrangements with his associates to take care of the situation so that he will be prepared to present that memorandum in the morning?

[955] Mr. Branch: Mr. Smith informs me that arrangements have been made so that it won't be necessary for me to get away before 5:00 o'clock.

Trial Examiner: Very well. We will proceed then, until 5:00 o'clock.

By Mr. Branch: *Q* I show you, Mr. Barney, what purports to be a copy of an agreement made as of June 1, 1936, between the Hartford Electric Light Company and the Connecticut Power Company, to which is attached what purports to be a copy of a letter which is from you to the Connecticut Power Company, in your capacity as vice president and general counsel of the Hartford Electric Light Company, and endorsed in behalf of the Connecticut Power Company with an acceptance by the vice president of that company.

Trial Examiner: Has Commission Counsel seen this?

Mr. Branch: No. I will show it to him.

By Mr. Branch: *Q* Are those correct copies, do you know, of what they purport to be?

Trial Examiner: I suggest you show it to counsel.

Mr. Wahrenbrock: I am sorry, I did not hear the question.

Mr. Branch: I asked him if those were copies of what they purport to be.

Mr. Wahrenbrock: Do you have copies of this, Mr. Branch?

[956] Mr. Branch: I am sorry to say that we have not. I will merely have it marked for identification and we will have copies made for you.

Mr. Wahrenbrock: I may have a copy; I am not sure.

Mr. Branch: May I proceed and offer it subject to your comparing it?

Mr. Wahrenbrock: Yes.

Mr. Branch: I believe I asked a question with regard to it.

Trial Examiner: Read the question.

(The question is repeated.)

The Witness: I cannot say from personal knowledge, except that it appears to be a photostatic copy of the original contract, and a photostatic copy of my signature in the letter looks like my signature.

Mr. Wahrenbrock: Mr. Examiner, I find that I have available four copies of what appears to be the same agreement, with additional correspondence, apparently in modification thereof, which has been filed with the Federal Power Commission, and if that will serve Mr. Branch's purpose, I think we can just put that in.

Mr. Branch: Thank you.

Mr. Wahrenbrock: It is a copy that was filed as a rate schedule with the Federal Power Commission.

Mr. Branch: Is this the same one?

Trial Examiner: I think there is some additional informa-
[957] tion on that.

The Witness: I believe they are the same ones, except the copy submitted by the Federal Power Commission Counsel has one modification on it, and then the various renewals of the agreement up to 1940.

Mr. Wahrenbrock: Mr. Examiner, inasmuch as the copy which I tender counsel is more complete, I believe it would be more desirable to use it.

Mr. Branch: Thank you. I will use the copies which Mr. Wahrenbrock has submitted to me, and I note that these also contain effective dates. In the one instance I think we disagreed as to what the Commission put in as the effective date.

Trial Examiner: I think it will be understood that those are not part of the contract but were notations made by the Commission.

Mr. Branch: Very well. I ask that this group of papers which Mr. Wahrenbrock has handed me, which consists of a copy of an agreement made as of June 1, 1936 and filed with the Federal Power Commission on November 9th, 1937, which copy consists of three pages and an amendment which is endorsed "File date

November 9th, 1937", with some other words, which I cannot read—a copy of a letter dated June 7th, 1937, filed with the Federal Power Commission November 9, 1937; a copy of a letter of May 4, 1938—the filing date apparently is September 1, 1939; and copy of a [958] letter of May 2, 1939, evidently filed with the Commission on September 1, 1939, letter dated April 22nd, 1940, evidently filed with the Federal Power Commission May 4th, 1940. I ask that that group be marked Exhibit 36 for Identification.

Trial Examiner: It may be so marked.

(The documents referred to are marked Exhibit Number 36 for Identification.)

Mr. Branch: I offer in evidence Exhibit 36 for Identification.

Mr. Wahrenbrock: No objection.

Trial Examiner: May I ask one question of the witness in connection with this, and that is whether on the letters of June 7th, 1937, May 4th, 1938 and May 2nd, 1939, the word "Superseded" has been added sideways on the letter at a later period? That is all I want to know—that they were not on the originals?

The Witness: I would assume that they were not on the original.

Trial Examiner: They are not a part of the letters, as you recall?

The Witness: No, they were not.

Trial Examiner: Is there any objection to the admission of the Exhibit 36?

Mr. Wahrenbrock: No, I am glad to have it in.

[959] Trial Examiner: Exhibit 36 will be received in evidence.

(Exhibit 36 for Identification was marked Exhibit 36 in Evidence.)

By Mr. Branch: *Q* I call attention to the recital reading as follows: "Whereas, the Hartford Electric Light Company is the owner of steam plants in the State of Connecticut which have sufficient capacity to supply The Connecticut Power Company with its primary needs, as hereinafter set forth, and also the water power plants of the Connecticut Power Company and the steam

plants of the Hartford Electric Light Company can be operated in conjunction to serve the combined loads of both companies with greater efficiency than if the facilities of each were applied primarily to the requirements of the zone system", and I want to ask, Mr. Barney, whether all of the steam plants of the Hartford Electric Light Company and all of the water power plants of the Connecticut Power Company which are referred to there are located in Connecticut? *A* Yes.

[*960*] *Q* And I call attention to clause 4 of which I am reading enough to convey the meaning but not every word: "The Hartford Company agrees to supply primary capacity to Connecticut Power Company as may be required in addition to the capacity of the Connecticut Power Company's own water power plants to carry the present agreed base primary loads of the Connecticut Power Company, in the following load centers", and then follow these names,—Middletown, Thomaston, Torrington, Housatonic Local—Falls Village, Manchester and Unionville. I am not reading the figures of the base loads. Paragraph 5 which reads in part: "The Hartford Company further agrees to furnish additional capacity as may be required from time to time by the Connecticut Company for its primary loads in the load centers set forth in Section 4."

Mr. Wahrenbrock: Mr. Examiner, I interject at this time to ask whether this is a question that is being framed by counsel, or whether he is just volunteering to read what is already in the record? If it is just a repetition of what is already in the record, I suggest that it is unnecessary.

Mr. Branch: I wish to direct the attention of the witness to this.

Trial Examiner: I rather assumed it was preliminary to a question, although it had become rather involved.

By Mr. Branch: [*961*] *Q* I will ask you whether all of the places mentioned in those load centers are in Connecticut, Mr. Barney? *A* Yes, sir, they are.

Q And the Torrington referred to there is the place which is served by the Torrington Electric Company, is it not? *A* Yes.

Q I might add this also, are there any lines between the generating plants of the Hartford referred to in that contract and the Connecticut Power Company referred to in that contract between the plants and those loads which are mentioned there—those load centers—which go outside of the State of Connecticut?

Trial Examiner: I will ask you to read that question.

[*962*] Mr. Branch: I think I can clarify that. It seems puzzling to the Examiner.

By Mr. Branch: *Q* Do the lines, the direct lines which run from those generating plants to those load centers go outside the State of Connecticut?

Mr. Wahrenbrock: Mr. Examiner, I think the Examiner's point has not yet been met. The lines aren't defined. They are already apparently in the record. They are lines which are interconnected with lines that go outside the State, and unless he defines them, limits those lines, the question is in conflict.

Trial Examiner: I think the words "direct lines" are rather indefinite there. Just what lines are you talking about?

Mr. Branch: The maps will show them. If there is any doubt, we will do it the other way. I didn't suppose there was any question about that.

By Mr. Branch: *Q* I now show you, Mr. Barney, what purports to be a copy of an agreement dated June 8, 1937, between the Hartford Electric Light Company and the Connecticut Power Company, and ask you whether that is a copy of a contract between those two companies—a correct copy.

Mr. Branch: I hand counsel a copy—I am afraid I am [*963*] neglecting the Examiner. My assistant who knows how to do these things correctly is not here.

Trial Examiner: I am afraid I have lost track of the exhibit numbers.

Mr. Wahrenbrock: I have no objection to this going in if I have an opportunity of checking.

Mr. Branch: We won't take Mr. Barney's time. If you will admit it is a copy, subject to your right to check.

The Witness: This is not a complete copy of the contract, because it hasn't got the Connecticut Power, Bristol contract, attached to it, which is incorporated by reference.

Mr. Branch: Is that in evidence, do you know?

Mr. Wahrenbrock: I am a little bewildered by the number of these things and I can't answer on the spur of the moment. I will be glad to check it, and if it will save confusion, I will check it immediately.

Trial Examiner: That might be the proper thing to do. It is a question that involves just what is in there.

Mr. Branch: To do what, sir?

Trial Examiner: To check that immediately.

Mr. Branch: These copies we have here—this original does contain it. This one doesn't have a copy of our Bristol contract. I find that that particular copy doesn't have it. Thank you for calling it to our attention. It is an omission.

[964] By Mr. Branch: *Q* I now hand you a document containing several more pages, and I ask you whether that does or not—

Mr. Wahrenbrock: Have you a copy of the document last referred to for me?

Mr. Branch: I think I gave it to you, and I think that yours did contain a copy. The one that I gave to the witness did not. I supposed they were all the same, but apparently some of them have that omission.

Trial Examiner: How many pages are there in all? If you will tell me how many there are supposed to be—this does not look as if it were complete. There are only five pages here.

Mr. Branch: No, yours is not complete either. We cheated you and the witness.

By Mr. Branch: *Q* Is that a complete copy, Mr. Barney? *A* It is a complete copy. I can't vouch as to its accuracy.

Mr. Branch: All right. Subject to your right to correct any mistakes, I would like to have that in evidence.

Mr. Wahrenbrock: Mr. Examiner, I am not sure on this short

notice that I am in a position to verify this at all. I have no reason to believe that it is not what it purports to be, and I make no objection as to the kind of copy it is.

[965] Trial Examiner: With the understanding that it will be later verified to satisfy counsel, the exhibit No. 37 will be admitted.

Mr. Branch: May I have this document which consists of eleven pages, the first five of which are numbered from 1 to 5, and the last six of which are numbered from one through six, being copy of the contract referred to. I ask that it be marked for identification No. 37.

Trial Examiner: It has already been admitted. I understood you to ask that it be admitted a while ago.

Mr. Branch: Well, this is another contract, sir.

Trial Examiner: You withdrew the one copy which was incomplete, and then sent in this other one. This is the one we have been talking about, isn't it, or do you have another one there now?

Mr. Branch: I introduced in evidence a sheaf of papers which related to various places, including Torrington. This group relates to Bristol. I presented something which the witness stated was not complete because the original had attached to it as an exhibit a copy of the contract between—

Trial Examiner: You also handed him later another one, which the witness states was correct, and which was admitted. It is admitted and is marked Exhibit No. 37.

(The document referred to was marked as Exhibit No. 37 in evidence.)

[966] Mr. Branch: I understood it is admitted in evidence.

Trial Examiner: That is correct.

Mr. Wahrenbrock: May I state at this point that the agreement of December 16, 1936, in six pages, which constitutes the last part of Exhibit No. 37, appears to conform to an agreement filed by the Connecticut Power Company, as rate schedules FPC No. 4, filing date No. 9, 1937. I make that statement for the purpose of

more ready identification by the Commission. I have not yet had any opportunity to discover the counterpart of the first part of the exhibit.

Mr. Branch: Yes. Has that part which you just referred to been put in evidence as a separate exhibit?

Mr. Wahrenbrock: I believe it is Exhibit 8 and Exhibit No. 25.

Mr. Branch: I think you are right. I think it is Exhibit 8.

Trial Examiner: Exhibit No. 8 appears to bear the same date, at any rate.

Mr. Wahrenbrock: You had better pause there, for there are two that bear that date between the two parties.

Mr. Branch: Exhibit 8 refers to the Bristol, and this thing that we are talking about refers to Bristol.

By Mr. Branch: *Q* Mr. Barney, are the contracts to which the Connecticut Power Company was a party, in regard to Torrington and in [967] regard to various plants, including—or in regard to Bristol, and in regard to various load centers, and in regard to Torrington, which have been put in evidence as Exhibits 36 and 37, still in effect as possibly modified?

Mr. Wahrenbrock: May the question be made more definite?

Mr. Branch: My point is this: These are evidently renewed from time to time, as they expire, by letter. My hurried examination of these documents would indicate that maybe the letters aren't quite up to date. Some of them apparently expired on June 16th of this year, and I want to know whether they have been continued so that they are still in effect.

The Witness: They are both in effect.

By Mr. Branch: *Q* And if they have expired subsequently to any time that is evidenced by the documents here, some letter has been signed—or something of that kind has been arranged, extending them? *A* The contract of June 1, 1936, as renewed from year to year, has already been renewed this year. So it will run until June 6, 1941.

Q 1941? *A* 1942, rather.

Q Yes. What is the main source of supply of the Connecticut Power Company under these two contracts, Exhibits 36 and 37, which relate to Bristol and Torrington, among [968] other places?

Mr. Wahrenbrock: Mr. Examiner, I am going to object to that question on two grounds. First, that it is beyond the direct examination, outside of the scope of matters opened up by direct examination. Second, that the question calls for an engineering opinion.

Trial Examiner: I think on the first point I will grant the objection. The objection is sustained.

Mr. Branch: May I have an exception?

Trial Examiner: The objection is sustained without going into the technical point. You have your exception.

By Mr. Branch: *Q* Mr. Barney, I show you a letter, what purports to be a copy of a letter, to you—from you to the Federal Power Commission, dated March 24, 1936, and ask you whether you sent such a letter to the Federal Power Commission?

Mr. Wahrenbrock: May I see a copy of the letter?

Trial Examiner: They are on the way around to you. I think perhaps before the question is answered, you will have it.

Mr. Branch: Give him copies of the others at the same time.

Mr. Wahrenbrock: Thank you. Mr. Examiner, I wish to make a statement at this time, that Commission's counsel will make no contention in this [969] case that the Commission has jurisdiction, or had jurisdiction, by reason of any transmission of electric energy during the continuance of the emergency caused by flood conditions during 1936, the early part of 1936, and if this line of inquiry is being opened up to rebut some assumption that we will make such a contention, I think the necessity therefor can be avoided. I do not mean thereby to take a position as to whether jurisdiction could be established on that basis, but I mean to say I will not attempt to do so.

* * * * * * [996]

CLARENCE W. MAYOTT,

a witness called on behalf of the Federal Power Commission, being first duly sworn, testified as follows:

Direct Examination by Mr. WAHRENBROCK.

Q Mr. Mayott, will you give your address, please? *A* My home address?

Q Yes. *A* 345 Auburn Road, West Hartford, Connecticut.

Q Your business address? *A* 410 Sheldon Street, Hartford.

Q By whom are you employed? *A* By the Connecticut Valley Power Exchange.

Q Is that a corporation? *A* It is not.

Q Will you explain what it is, just briefly, for this present purpose? *A* It is an unincorporated voluntary association of companies, to obtain the greatest overall efficiency of operations, in other words, to save the largest amount of fuel possible in the generation of power in that particular group.

Q Does it own any property? *A* It does not.

Q Does it have a bank account? [997] *A* It does not.

Q Does it pay your salary? *A* It does not—it does, indirectly, yes.

Q By whom is your salary paid? *A* My salary is paid directly by the Hartford Electric Light Company.

Q And credits and debits are made as between the members of the Association in settlement for the payments which it makes? *A* In total.

Q What is your position with the Connecticut Valley Power Exchange? *A* Manager.

Q Have you any superior in that organization? *A* The Exchange members.

Q You are responsible to the members of the Exchange? *A* To the members of the Exchange.

Q At the present time, who are those members? *A* The mem-

bers that have control for the various ones are Mr. F. L. Hunt, for the Turners Falls Power and Electric Company.

Q What is his position with that company? *A* He is vice president.

Q Vice president? *A* Vice president. Mr. Pope, vice president of the New [998] England Power, and my contact is mostly with his assistant vice president.

Q What is the name of the assistant? *A* W. R. Bell.

Q Will you continue? *A* And Mr. S. Ferguson, president of the Connecticut Power Company.

Q Mr. Samuel Ferguson? *A* Mr. Samuel Ferguson. Mr. A. D. Colvin was appointed as the representative, quite some time back, and my contact has been mostly with Mr. Ferguson for the Connecticut Power.

Q There are three at present, only three members of the Exchange? *A* Only three members of the Exchange—the Connecticut Power Company, the Turners Falls Power and Electric Company and the New England Power Company.

Q Does the Exchange at present have contractual relations with companies other than those you have named, for the purchase of Exchange power? *A* There are no contractual—

Mr. Branch: (Interrupting) Excuse me just a moment. May I have that question repeated?

(The question is read.)

The Witness: There are no contractual relations. There are certain agreements as on file with the Federal Power Com- [999] mission.

By Mr. Wahrenbrock: *Q* Under those agreements, does the Exchange receive, deliver or interchange electric energy with other companies other than those you have named? *A* Yes.

Q Will you name those companies? *A* It has an agreement with the Central Hudson Gas and Electric Company in New York State which is on file with the Federal Power Commission.

Q Its relations with the Central Hudson Gas and Electric are determined by a contract for the purchase, sale or interchange of

electric energy, are they? *A* By agreement on a day by day, and almost an hour by hour basis.

Q I do not understand the distinction you have in mind between a contract and an agreement, as you answer my questions. *A* Well, it seems to me that a contract would be something that you were held to for some length of time.

Q But there is an arrangement under which energy may be bought or sold or exchanged and paid for, and which when bought or sold or exchanged must be paid for at a price that is fixed?

Mr. Branch: I object to that as leading.

Trial Examiner: I think the question is very definitely [*1000*] leading.

Mr. Wahrenbrock: I don't mean to suggest that there is or is not.

By Mr. Wahrenbrock: *Q* I am asking you whether that is the fact, Mr. Mayott.

Mr. Branch: I object on the ground that it is still leading.

Trial Examiner: It is still leading. I would suggest that you give the witness a chance to explain the nature of the contract or agreement itself.

By Mr. Wahrenbrock: *Q* Will you do so briefly, Mr. Mayott? I know that it is on record with the Commission, and it may be put in evidence later, but I would like a brief statement of what that agreement is with the Central Hudson Gas and Electric Corporation? *A* The agreement with the Central Hudson Gas and Electric Association—

Q Is it an Association or a corporation? *A* A corporation. It is the same as the agreement between the three parties to the original Exchange. They will deliver—they deliver power on an incremental basis, whenever there are any savings to be made, by transferring it to Connecticut, and they receive power whenever there is a saving to be made by them receiving power from Connecticut. It is not on a fixed [*1001*] charge or credit basis at all. It is entirely upon the momentary value of the power at the time of the transfer.

Q When electric energy under that agreement has been delivered to the Central Hudson Gas and Electric Corporation during a given billing period, is that corporation entitled to participate in the savings of the Exchange for that billing period? *A* They participate in the savings, they participate in the savings that they are instrumental in making.

Q Will you explain the basis of their participation in the savings a little bit further? How do they participate and to what extent? *A* They participate inasmuch as the investment in that line was made for exchange purposes only, and is in no way connected with the transfer of primary energy. Any savings that are made in transfer over that line, any net savings, beyond those delivered to such companies as might be beyond, is divided between the Connecticut Power Company and the Central Hudson Gas and Electric Company.

Q Mr. Mayott, I thought I understood the basis upon which the members participate in the savings of the Exchange, but I do not yet understand clearly the basis upon which the Central Hudson participates. Will you explain first the basis upon which the three members of the Exchange participate in the savings realized by the Exchange? [*1002*] *A* The three members of the Exchange participate equally in the net savings of the Exchange after all operating and capital investment savings have been credited.

Q Are the payments made to the Central Hudson Gas and Electric Company deducted from the gross savings before there is a division of the net savings to the members of the Exchange? *A* The members of the original Exchange do not participate in any savings as are now being made to Central Hudson, because the amount of that saving is so small that it has never paid a reasonable return on—the savings have never paid a reasonable return on the investment made for that investment or purpose.

Q Who put up the investment that was involved to make the Central Hudson Gas and Electric interconnection? *A* I understand it was the Connecticut Power Company and the Central Hudson Gas and Electric Corporation.

Q And that investment was the investment in the so-called E-line from Falls Village to the New York-Connecticut State Boundary, so far as the Connecticut Power Company was concerned, was it? *A* Originally it went farther than that, I understand.

Q At the present time. *A* At the present time it is to the State line.

Q And the investment, so far as the Central Gas and Elec- [*1003*] tric Corporation is in that same E-line as it extends from the Connecticut-New York State boundary to Poughkeepsie? *A* Yes.

Q The financial settlements, then, for the exchanges between the Central Hudson Gas and Electric or with the Central Hudson Gas and Electric, are made between the Connecticut Power Company and the Central Hudson Gas and Electric Company? *A* No, they are made between the Exchange and the Central Hudson Gas and Electric.

Q But they are made on a basis of calculation which involves only the Central Hudson Gas and Electric and the Connecticut Power Company? *A* You mean the savings?

Q The payments made to those corporations with respect to those exchanges. *A* The payment of savings made over the so-called E-line are given to the Central Hudson and to the Connecticut Power Company as partial reimbursement for the investment that they have incurred in that E-line to make exchange possible between New York and Connecticut.

Q Can you illustrate that by taking a single transaction or two transactions, which would give rise to a saving, and show how that saving would be divided? *A* Well, we would assume that we might deliver power at the cost of zero to generate in New England over to Central [*1004*] Hudson, and it might cost—it might have a value to the Central Hudson as against their production over that way of $100, say, in which case, say, $60 would go to the Central Hudson and $40 would go to the Connecticut Power Company, the $60 and $40 being the ratio of the investment chargeable against exchange in the two cases.

Q In that transaction that you have used for the purpose of illustration, would the Turners Falls Company participate at all in the savings arising out of the transaction, in which it had contributed the energy? *A* No.

Q The answer is, No? *A* The answer is, No.

Mr. Branch: May I have that stricken out on the ground that it does not appear that there is any situation in which Turners Falls would supply the energy?

Mr. Wahrenbrock: I will be glad to qualify that question by a further question to the witness.

Trial Examiner: I think that you should lay the groundwork for that first.

By Mr. Wahrenbrock: *Q* For purposes of illustration which you used, Mr. Mayott, were you assuming that the energy from Massachusetts would have been contributed by the Turners Falls Company? *A* I did not make any assumptions, I just gave you an [*1005*] illustration.

Q What are the sources of zero-cost energy in exchange? *A* Oh, there have been some times when such zero power was from Falls Village and from the Western Massachusetts companies, and I believe possibly there have been some occasions when there has been some from the New England Power Company.

Q On such occasions as there have been zero-cost energy from the Massachusetts companies, has that energy been delivered to the Exchange by the Turners Falls Company? *A* May I have that question read?

(The question is read.)

The Witness: There has been some from the Turners Falls Company.

Mr. Wahrenbrock: I think that meets the objection which Mr. Branch offered.

Trial Examiner: I believe that it does. I have taken this method, Mr. Branch, of permitting it to be satisfied afterwards, because of the fact that counsel did not object to the question when it was asked, but made a motion to strike.

[*1006*] Mr. Branch: Well, it does not seem to me that there is any proof that there are instances of that, and if that is important, it seems we might find out whether there were any meters at the New York-Connecticut line that would measure in any way the power going to Central Hudson, as showing its origin.

Trial Examiner: Mr. Branch, I believe there are some statements that lead that way, and if counsel desires to question further, he can bring that out on cross-examination.

Mr. Branch: You understand I still object, and I think a motion to strike should be granted, and I object to this last question, and ask that all the questions with regard to this inquiry be stricken.

Trial Examiner: The motion is refused. An exception will be granted to the respondent.

By Mr. Wahrenbrock: *Q* Returning to the question I have been trying to develop here, the subject matter that I have been trying to develop, Mr. Mayott, what would become of the savings on the E line if there were profits arising from those transactions beyond the charges on the investment? *A* If there were charges beyond the investment it would be divided up between those parties, all the parties to the transaction. But there never has been.

Q I believe you misspoke yourself.

[*1007*] Mr. Wahrenbrock: May I ask that the answer be read back? I think you said "charges" for the word "profit".

Trial Examiner: The reporter will read the answer.

(Whereupon the last answer as above recorded, was read by the reporter.)

The Witness: I should have said "savings".

By Mr. Wahrenbrock: *Q* When you are referring to parties there, you were referring to the Central Hudson Gas Electric Corporation and the Connecticut Power? *A* No, I was referring to the Central Hudson Company and the Connecticut Valley Exchange.

Q And by the Exchange you mean— *A* The Connecticut Valley Power Exchange.

Q And you mean the three members you have named? *A* The three members.

Q Then is the reason for the different arrangement in case of the transaction over the E line the fact that the savings aren't enough to pay the charges on the investment? *A* In principle there is no difference between those transactions and the rest of the exchange.

Q Are there other companies with which energy transactions are carried on by the exchange? *A* Not directly.

Q Will you explain what you mean by not directly? [*1008*] *A* The Central Hudson Gas & Electric Company have other corporations which they are connected to, and the New England Power has a number of connections which they are connected to.

Q You haven't explained the relation of the New England Power Company to the exchange? *A* The New England Power Company is a member of the exchange.

Q Excuse me. I was in error. A little bit ago you mentioned the Western Massachusetts Company. *A* If I mentioned the Western Massachusetts Company, I was thinking of Turners Falls. The Turners Falls Power & Electric Company is one of the Western Massachusetts companies.

Q Well, will you explain how energy transactions are carried on where energy is derived from other companies of the Western Massachusetts group than the Turners Falls Company? *A* That is entirely taken care of by the Turners Falls Company. As far as the exchange is concerned, they don't enter into any of the transactions between the Turners Falls Company and the other members of the Western Massachusetts companies. As far as we are concerned, they are a unit we have nothing to do with. They are internal—

Q I would like to ask one or two questions to get that clear. I think you realize that while it is very familiar to you, this exchange operation is novel enough to those of [*1009*] us who don't deal very much with it, that it is a little difficult to grasp at first. Perhaps an illustration is a good way to develop what I would

like to find out. Can you give me the name of some generating plant owned by one of the Western Massachusetts companies other than the Turners Falls Company from which you sometimes get energy. The Cabot plant is owned by the Turners Falls Company? *A* Yes.

Q What other plants do you sometimes call on up there? *A* Well, there is the plant at Springfield.

Q Who is that owned by? *A* By the United Electric Light Company.

Q Is that one of the Western Massachusetts companies? *A* Yes, one of the Western Massachusetts companies.

Q When Springfield has capacity available which is not required for any of its own requirements, and can produce energy at a lower incremental cost than the lowest incremental cost available among members of the exchange, how does the exchange avail itself of that?

Mr. Branch: I object to that on the ground that it doesn't appear that that occurs.

Trial Examiner: Will you first lay the groundwork for your question?

Mr. Wahrenbrock: Yes.

By Mr. Wahrenbrock. [*1010*] *Q* Mr. Mayott, are there occasions on which savings can be realized among the members of the exchange by calling upon the Turners Falls Company to deliver electric energy generated from the Springfield plant? *A* I was trying to recall any such occasion in recent years, but I don't recall it now.

Q Well, you do at times get energy from the United Electric Light, do you not? *A* I can't recall of any such instances in recent years.

Q Well, do you occasionally receive electric energy from the Turners Falls Company that is generated at the Gardners Falls plant?

Mr. Branch: I object. I don't know that the witness knows

about that. Unless he knows that, I think it ought to be made clear that he must be restricted to what he knows.

Trial Examiner: Apparently the witness talks as if he knew. He claims to be the head of the exchange and should know where the power comes from.

Mr. Branch: My understanding is that all his duties call upon him to do is to make calculations and settlements with the Turners Falls, the New England Power, and the Connecticut Power, and also the Central Hudson. I don't understand that he has any duty to go any further than that, and if my understanding on that is correct, it seems to me there is no basis for asking him this question.

[*1011*] Trial Examiner: His knowledge is being explored here, and I think he may answer as to what he does know.

Mr. Branch: Yes, but I think it should be made clear that he is testifying only as to what he does know himself.

Trial Examiner: That may be. I don't think he has indicated he didn't know here from the nature of his answers.

Mr. Branch: I didn't so understand them, sir. I object to the question on the grounds I have specified.

Trial Examiner: It seems to me the question asked him—if he doesn't know certain things, then the only answer he can make is to that effect. He has answered as if he had full knowledge. The objection will be overruled.

By Mr. Wahrenbrock: *Q* Will you answer my question, Mr. Mayott? *A* Will you repeat the question?

Trial Examiner: The reporter will read the question to the witness.

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: That is a part of the Turners Falls system, whose load I am not familiar with, and I couldn't tell you whether there is any power ever received from that particular plant.

By Mr. Wahrenbrock: [*1012*] *Q* I am still trying to get an example of an instance in which the energy comes from the plant

of some other company than the Turners Falls Company, in order to ascertain how the financial settlements are made for the savings growing out of those exchanges, and perhaps the easiest way will be for me to refer to this photostat—

Trial Examiner: Has the respondent's counsel had an opportunity to inspect that?

Mr. Wahrenbrock: Respondent's counsel has furnished me with this copy.

Trial Examiner: I suggest that counsel be given an opportunity to know what document you are talking about.

Mr. Wahrenbrock: I was going to identify it.

Trial Examiner: Show it to him before you identify it.

Mr. Wahrenbrock: I think he has a copy.

Mr. Branch: I don't know what he is talking about. I take it that you don't object to my seeing it.

Mr. Wahrenbrock: I certainly don't, but you have copies, or your client has access to them.

Trial Examiner: I think that is immaterial, in view of the fact that respondent's counsel has a right to know what is being shown to the witness, and not necessarily be forced to study his own files in order to be sure.

(The documents were handed to Mr. Branch.)

Mr. Branch: You haven't a magnifying glass, have you?

[*1013*] Mr. Wahrenbrock: No, I do not have. I don't require the assistance of one, I am glad to say.

Mr. Branch: You are very lucky. Did you say we furnished you with this, Mr. Wahrenbrock?

Mr. Wahrenbrock: I am considering, in order that I may recall the details.

Mr. Branch: This is nothing that appears to come from us.

Mr. Wahrenbrock: You are right in asking the question, Mr. Branch. The log sheets which your company furnished were the log sheets of the Falls Village plant. The log sheets of which those are photostats were furnished to us by the Connecticut Valley Power Exchange. I will be glad to read it to you.

Trial Examiner: I would suggest that this would be a pretty good time to take a five-minute recess.

(At this point a short recess was taken, after which the hearing was resumed.)

[*1014*] Trial Examiner: The hearing will be in order.

By Mr. Wahrenbrock: *Q* Respondent's Counsel has now returned, and I show the witness a photostat of the Connecticut Valley Power Exchange—load control supervisor's log sheet, for Sunday, May 2nd, 1939, being a photostat which was made for me by arrangement with the Connecticut Valley Power Exchange, and I call the witness's attention to the third general column on that photostat, which is headed "Hydro-Generation", and I call his attention to the headings under that general heading,—the first one is Cabot, the next one is Number 1 Station, T. F., the second one is Gardner's Falls, and I may say that abbreviations are used, which I will not take time to spell out. The next one is Cobble Mountain, the next one is United Electric Light Company No. 2 Station, the next one is the United Electric Light Company Number 3 Station, the next one is Hartford Electric Light, Miscellaneous, the next is Falls Village. There are some more, but there are no entries under them until we come to the totals at the end of that division of the log sheet. Now, Mr. Witness, directing your attention to those I have named, I will ask you what those headings indicate? *A* They indicate the generation at that particular hour at that particular station.

Q To supply the electric energy which was received by the Exchange? [*1015*] *A* To supply the total. First, of course, it would go to their own system.

Q Have you completed your reply? *A* Yes.

Q What do the figures under those headings for any particular hour indicate? *A* Only the generation at that particular station.

Q What relation had those figures to the operation of the Connecticut Valley Power Exchange? *A* Merely that that was the most efficient operating load for the whole Exchange for that particular period.

Q Now, in such a case as is shown by the first hour for that day, where the figure of 36 appears under United Electric Light Company No. 2 Station, what does that refer to? *A* That is the load of No. 1 Hydro Station of United Electric Light Company at that particular time.

Q The No. 2 United Electric Light Company at that particular time. *A* The No. 2 United Electric Light Company Station at that particular time.

Q Is that the total load on that station during that hour? *A* That is the total load on that station. That is the integrated kilowatt hours for the hour between 12:00 and 1:00 on that particular day.

[*1016*] *Q* May that station during that hour have also been supplying other energy to other loads? *A* No.

Mr. Branch: Mr. Wahrenbrock, have you another copy of that that I can see? It is so difficult to see it anyway, and I would not like to interfere with you.

Mr. Wahrenbrock: Would you like to look at it? There is only one copy available. I have no other copy.

Trial Examiner: Are you going to be in a position to get another copy for the record?

Mr. Wahrenbrock: This is just to take an illustration at this point, Mr. Examiner. I think the facts appear on the record clearly enough as to what is being referred to.

Trial Examiner: It is rather a complicated proposition to get it in the record with relation to this document which you are referring to.

Mr. Wahrenbrock: I have asked the witness questions, which I think bring it out and explain it.

By Mr. Wahrenbrock: *Q* Does that "36" mean 36,000 kilowatt hours? *A* No, it means 3,600 kilowatt hours.

Q 3,600 kilowatt hours? *A* There is a dot in there. It is very indistinct. They don't always put it in, but that is 3,600 hours.

Q The columns read in thousands, and that is 3.6 thou- [*1017*] sands? *A* Yes.

Q How were financial settlements for that energy made between the Turners Falls Company and the United Electric Light Company? *A* That is entirely within the Western Massachusetts companies themselves, and I have no knowledge.

Q At what incremental cost figure would that energy be accounted for by the Connecticut Valley Power Exchange?

Mr. Branch: I don't know that it appears that it would be accounted for at all. Until that appears, I object to the question.

By Mr. Wahrenbrock: *Q* Would the receipt of 3,600 kilowatts as shown by the instances to which I have referred, be accounted for in the operations of the Connecticut Valley Power Exchange?

Mr. Branch: I don't understand that that was a receipt by the Connecticut Valley Power Exchange, so I object to the question as apparently containing an assumption which is not so. It certainly is not shown.

Mr. Wahrenbrock: All right.

By Mr. Wahrenbrock: *Q* I will ask if the sub-column under "Hydro-Generation" which is headed "Total Hydro", and which for that hour and day is shown to be 66.5, if that represents the total energy [*1018*] receipts of the Connecticut Valley Power Exchange derived from hydro-electric sources? *A* Not delivered to the Connecticut Valley Power Exchange. That is the total generation for the hydro-stations of members of the Connecticut Valley Power Exchange.

Q What is the purpose of showing that on this log sheet? *A* To assist in scheduling of the load and keep track of the load.

Q Assist how in the scheduling of the load and keeping track of it? *A* Just what do you mean?

Q What is the purpose of putting it there; what do you do with the figures? *A* We use this as a record as to what has been done, and to assist us in future days in scheduling the load so that there is sufficient capacity on the total system to carry the load and carry it in the most efficient manner.

Q That is pretty general, and I would like to get it a little bit clearer on one or two details of this. I would like to ask you how

that figure enters into the accounting among the members of the Exchange at the end of the month. *A* That particular figure does not.

Q Is that particular figure included in a total for the day and the totals for the day included in a total for the month [*1019*] which enters into the settlement among the members of the Exchange? *A* No.

Q Does the total under the heading that I have previously referred to, United Electric Light Company No. 2 Station, the total at the bottom of the column for the day, enter into the accounting calculations of the Exchange in settlement with its members at the end of the month? *A* No.

Q In considering the receipt of electric energy during the first hour for the day to which we have been referring, does the incremental cost of that 3,600 kilowatt hours of electric energy enter into the accounting of the Connecticut Valley Power Exchange with its members? *A* Only in so far as that particular figure might affect the total generation by hydro. In itself, it does not.

* * * * * * [*1026*]

By Mr. Wahrenbrock: *Q* When the incremental cost of the electric energy which the Turners Falls Company delivers to the Exchange is a particular amount, is that the amount which is taken into account by the Exchange in calculating the savings of the Exchange from that transaction?

Mr. Branch: The same objection.

Trial Examiner: I think you are still dealing with the question not of facilities but of distribution of costs.

Mr. Wahrenbrock: Mr. Examiner, this is all in the course of establishing what this unincorporated Exchange, which apparently is not a legal entity at all, is, and if it is a method of keeping books, I believe that I should go in at least to the first step in how these savings are calculated, which is the raison d'etre of the Exchange.

The Trial Examiner: You may examine as to the purpose of the

Exchange, if that is what you have in mind. Is that what your question leads to—the purpose of the Exchange?

Mr. Wahrenbrock: That is what I have been trying to frame it to reach. I may not have succeeded as well as I should.

Trial Examiner: For that purpose I will permit the inquiry.

The Witness: May I have the question repeated?

(The question is repeated.)

[*1027*] The Witness: That is only one part of the transaction.

By Mr. Wahrenbrock: *Q* Yes. That is— *A* That is the incremental cost of the power that they deliver to the Exchange at that particular time.

Q Yes. That incremental cost which is taken into account by the Exchange in calculating the savings from the receipt of that energy and its delivery is based, so far as its receipt is concerned, upon the incremental cost of the generation of that electric energy? *A* Upon the incremental cost of the generation of that energy.

Q Regardless of whether it is generated by the Turners Falls Company. *A* That is the incremental cost, wherever it is generated for the Exchange.

Q And the calculation of the savings by the Exchange depends upon a knowledge of the incremental cost of generation of the energy, doesn't it?

Mr. Branch: The same objection, and also that it is leading.

Mr. Wahrenbrock: All right; I will turn it around to obviate that.

By Mr. Wahrenbrock: *Q* Then, does the calculation of the savings by the [*1028*] Exchange depend upon a knowledge of the incremental cost of generation?

Mr. Branch: I think it is still leading and subject to all the same objections.

Trial Examiner: I think it is largely cured. To a certain extent questions must be rather in that form.

Mr. Wahrenbrock: I think it has been established by the testimony already in.

Trial Examiner: I think it is in line with the testimony already

given. The witness may answer the question, and note an exception for the Respondent.

Mr. Branch: Exception.

By Mr. Wahrenbrock: *Q* Do you have the question in mind, Mr. Mayott? *A* I would like to have it read.

Trial Examiner: The question will be read for the benefit of the witness.

(The question is read.)

The Witness: It does.

By Mr. Wahrenbrock: *Q* What are your duties as Manager of the Exchange? *A* To coordinate the operation of the various members of the Exchange, to see that the most economical generation of power is carried out, to oversee the calculations necessary to [*1029*] arrive at billings as between the companies, for the transfer of power, and to act as a general coordinator between the companies for all purposes of operation.

By Mr. Wahrenbrock: *Q* Do you supervise or conduct the making of studies to determine or to verify the incremental costs of generation at particular plants, under particular conditions?

Mr. Branch: It is understood that my objection goes to this whole line of inquiry?

Trial Examiner: The objection is overruled and the witness will be permitted to answer the question.

Mr. Branch: And is it understood that my objection applies to this whole line of inquiry, without my continual interruption?

Trial Examiner: It is.

The Witness: May I have the question repeated?

Trial Examiner: The question will be read.

(The question is read.)

The Witness: I have nothing to do with the individual operation of any of the plants.

By Mr. Wahrenbrock: *Q* I so understand, but that was not my question. *A* The individual companies furnish me with all operating data, and any other data that might be pertinent from which I might arrive at the various costs, and any studies made are en-

tirely in coordination with the individual companies,—the [*1030*] men in the individual companies who have that particular duty.

Q From data which is made available to you by members of the Exchange, do you make studies to determine incremental costs of generation at particular plants, under particular conditions? *A* Yes, we do.

Q And do you keep current information on that subject? *A* We do.

Q And what do you use that information for? *A* In arriving at the incremental cost of the power transferred to and from the Exchange by the individual companies.

Q Yes. And what do you use your information as to that incremental cost for? *A* Also in scheduling the loads on the individual stations, in coordination with the dispatchers of those individual companies.

Q Now, will you explain your duties in that connection? *A* To make a schedule out each day as to the most efficient combination of generation, and then pass it through to the dispatchers of the individual companies, whose duty it is to either accept or reject the schedule as given. If they are agreeable, they will follow this scheduling, if they are not, they will say so, and they have the ultimate decision as to whether it shall be done or shall not be done.

[*1031*] *Q* When you say that if they decide to do so, they follow the schedule, what do you mean by "follow the schedule"? *A* They will load the station up as we recommend.

[*1032*] *Q* Does the schedule which you recommend indicate the stations which are to be loaded during particular hours? *A* It does.

Q What is the object of such a schedule? *A* The object of such a schedule is to coordinate the operation, the greatest or the maximum number overall efficiency of the generation.

Q I am sure that is—well, I will say this, that I am not sure that I personally, as a layman, understand the implications of coordination. Does that mean that the connected loads are served

from the most efficient available generating plants at all times? *A* The most efficient combination at all times.

Q And the energy from the most efficient plants, generating plants, acting in combination, is used to supply the loads at all times? *A* Essentially, yes.

Q Is there some qualification or something wrong with my statement? *A* There is a qualification. I might put it this way, that the most efficient station in one end of a system might not be the place to generate for some place on the other end of the system, where you have got to transfer it.

Q The cost of transferring the energy from what would otherwise be the most efficient station to the load has to [*1033*] be taken into account? *A* It does.

Q And what does that cost include? *A* All the losses from the line, and all the other losses from the station to the point of the load.

Q Does it include toll? *A* The toll?

Q Toll. *A* Coal?

Q No, the toll—t-o-l-l, on the CP lines? *A* No.

Q It includes energy losses in the lines and transformers? *A* All energy losses.

Q What are the energy losses? Where do they occur? *A* In transformers and lines.

Q And those—the cost of those energy losses has to be taken into—do the cost of those energy losses have to be taken into account in determining whether a particular generating plant should be called upon to supply a particular load?

Mr. Branch: May it please the Examiner, I haven't wanted to interrupt while it seemed to me the questions were in the scope of the last ruling of the Examiner. It seems to me now this certainly is getting beyond it, and is getting back into the kind of questions as to which the objection was [*1034*] sustained.

Trial Examiner: I think we are still dealing with facilities, and not the billing here, and the objection will be overruled.

By Mr. Wahrenbrock: *Q* Do you have the question in mind? *A* May I have it repeated, please?

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: Yes.

By Mr. Wahrenbrock: *Q* The result of that kind of operation which is carried out under your direction is that the efficient combination of generators—the most efficient operation of generators is used so as to cause a flow of energy from one system to another, when that will reduce their joint costs. *A* I will ask you to repeat that, please.

(Whereupon the last question as above recorded, was read by the reporter.)

Trial Examiner: It seems to me that that question is ambiguous.

Mr. Wahrenbrock: I have not framed my question as I intended it to be.

By Mr. Wahrenbrock: *Q* The presumption is that energy flows back and forth [*1035*] between the systems when it is to the mutual advantage of the system to do so? *A* It is. It does.

Q How long have you been manager of the Connecticut Valley Power Exchange? *A* Since 1925.

Q When was the first Connecticut Valley Power Exchange initiated? *A* In 1925.

Q And have you been the manager from the beginning? *A* From the beginning.

Q Was the Connecticut Light and Power Company ever a member of the Connecticut Valley Power Exchange?

Mr. Branch: Excuse me. I didn't understand that question.

Trial Examiner: The reporter will read the question.

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: It was.

By Mr. Wahrenbrock: *Q* At what time? *A* At what time?

Q Yes. *A* Or what date?

Q Between what dates? *A* From, I believe it was 1928 till 1935.

[*1036*] *Q* During the time it was a member of the exchange, who were the other members of the exchange? *A* The Hartford Electric Light Company and the Turners Falls Power & Electric Company.

Q Was the plan of operation of the exchange during that period of time substantially as you have just described it? *A* The basic principles of the exchange have remained the same since 1925.

Q Has the Exchange been in continuance—has the Exchange been in existence at all times since 1925?

Trial Examiner: This is somewhat of a new line of questions. I would like to know whether the objection persists at this point?

Mr. Branch: Yes, sir, it does. It seems to me this is going way beyond any issue in this case, as to what was done at that ancient period.

Trial Examiner: The Examiner states—I believe the witness's answer was not entirely clear a while ago as to the end of the time. He spoke of 1935. Now, that brings it within—unless that is clarified, that brings it within the time limit, if that is what counsel has in mind.

Mr. Wahrenbrock: I think that is a very good suggestion.

By Mr. Wahrenbrock: *Q* Are you able to fix the date of the termination of [*1037*] the Connecticut Light and Power Company's membership in the exchange more definitely? *A* August—

Mr. Wahrenbrock: Mr. Examiner, I am willing to withdraw that question, and instead of asking for what may be a legal conclusion as to the effect of a contract arrangement, I am going to ask—

By Mr. Wahrenbrock: *Q* I am going to ask, if you will, to fix the date when the Connecticut Light and Power Company ceased to deliver or receive electric energy as a member of the exchange.

Mr. Branch: Just a minute, please. May I have the question read?

Trial Examiner: Exception will be noted for the respondent.

* * * * * *

(Whereupon the last question as above recorded, was read by the reporter.)

Trial Examiner: You may answer the question.

The Witness: I would place that as on the 24th of August, 1935.

By Mr. Wahrenbrock: *Q* And are you able to fix the hour? *A* I am afraid I haven't the hour here.

Q Mr. Mayott, I am going to show you a typewritten copy furnished me by Mr. Barney, of certain excerpts from Connecticut Valley Power Exchange Load Control Supervisor's Report, Saturday, August 24th and Sunday, August 25th and [*1038*] Tuesday, August 27th, 1935, and I ask you if by referring to that or to any papers in your possession you are able to refresh your recollection and state at what hour the Connecticut Light and Power Company ceased to receive or deliver electric energy to or from the Exchange? *A* From this it would be at 2:22 P.M. August 24th.

Q And you how do you fix that time? Excuse me. Did I understand you to say August 24th? *A* August 24th.

Q And how do you fix that time? *A* On this excerpt from the Connecticut Valley Power Exchange load control supervisor's report, for Saturday, August 24th, 1935, Daylight Saving Time, there is this note:

> "No. 1 C.P. Line was cut away from New Britain Tap at 2:22 P.M."

It means that some time previous to that they had opened their switches.

Q And what does it mean "No. 1 C. P. line was cut away from the New Britain tap"? *A* It means that there was a distinct—I will give you my interpretation of that, as this is a telephone conversation. It means to me that the line had been definitely opened, the transmission line had been definitely opened at that particular place.

Q From the C. P. No. 1 line? [*1039*] *A* From the C. P. No. 1 line.

Q Was the New Britain tap of the Connecticut Light and Power Company disconnected from the C. P. No. 2 line? *A* Undoubtedly both oil switches were opened at that time—previous to that time.

Q Did other members of the Exchange continue to operate as an Exchange after that? *A* Yes, until the next day.

Q Did they cease to operate as an Exchange on the next day? *A* They did.

* * * * * *

Q Did the Connecticut Light and Power Company thereafter ever participate in the operations of the Exchange?

* * * * * * [*1040*]

The Witness: After the opening of all of the State lines in what was considered to be a satisfactory manner to all concerned, the Connecticut Light and Power again connected up with the Connecticut Power Company and coordinated their operations with the Connecticut Power and the Hartford Electric Light Company until the emergency in 1936.

By Mr. Wahrenbrock: *Q* Then what happened? *A* You mean at the emergency?

Q Yes.

* * * * * * [*1041*]

Mr. Wahrenbrock: I am not interested in making the contention, if the Examiner please, that their acts during the period of the emergency, whatever that was, as being a basis for jurisdiction, but I do want to lay the basis of whether outside of the period of the emergency, they were ever afterwards participating in the Exchange, and I therefore have to define the period of the emergency, to that extent, at least. I am not sure that it will actually do that.

Mr. Branch: I object to this question and suggest that that purpose could be achieved by asking whether after the end of the

emergency, at any time with interstate connections, the Connecticut Light and Power Company was ever a member of the Exchange.

* * * * * *

Trial Examiner: I think that the suggestion of counsel for the respondent would require a further explanation as to the witness's understanding of the end of the emergency. That is the great difficulty on that score. I think to save time, and as any immaterial parts may be discarded by the Examiner in his study of the testimony and by the Commission, I think under the circumstances it might be well to let the question be answered.

* * * * * * [*1042*]

Trial Examiner: Exception will be noted for the respondent.

* * * * * *

The Witness: The emergency is quite a complicated and long thing to explain. When the emergency occurred, all questions of exchange had to be thrown overboard.

By Mr. Wahrenbrock: *Q* Can you give me the dates of the Connecticut Light & Power Company's interconnection at New Britain after the disconnection to which you have referred, on August 24th?

Mr. Branch: May I have the question read while the witness is looking over his notes?

Trial Examiner: The question will be read for the benefit of counsel.

(The question is repeated.)

The Witness: On the excerpts from the Connecticut Valley Power Exchange Load Control Supervisor's report for Tuesday, August 27th, 1935, Daylight Saving Time, there is this item:

> "1:07 P.M. No. 2 C. P. line Point 12 to 474 out of service to reconnect the tap line at New Britain."

[*1043*] That means that it was reconnected some time after 1:14.

By Mr. Wahrenbrock: *Q* May I interrupt you to ask what Point 12 is? *A* That is the switching point of the Connecticut Power Company.

Q The switching point at which what branch line is tapped to the main line of the Connecticut Power Company? *A* To the main lines from Hartford.

Q Isn't Point 12 the point at which the Middletown Branch Line taps C. P. 1 and C. P. 2? *A* Well, it is a switching point for the lines going west and the lines going to Hartford, and the lines going to Middletown.

Q And what is Point 474 or Tower 474? *A* Tower 474 is another switching point at Bristol Mountain. Incidentally, I am not an expert on the construction of the C. P. Company's system.

Q Is Bristol Mountain the point from which the branch line to Bristol leaves the C. P. 1 and C. P. 2 lines? *A* I believe it is.

Q I just wanted that explanation inasmuch as there was that language in there. Will you continue with the answer you were giving? *A* I thought I had finished.

Trial Examiner: Does the witness desire his answer read back to him?

[*1044*] The Witness: Yes.

Mr. Wahrenbrock: And the question too, please.

Trial Examiner: The Reporter will read the question and the answer of the witness.

(The record is read.)

By Mr. Wahrenbrock: *Q* Some time within a few hours after that? *A* Within a few hours.

Q Was it subsequently disconnected again?

Trial Examiner: May I interrupt for a moment? Does the record show that that was 1935?

By Mr. Wahrenbrock: *Q* It was 1935, was it, Mr. Mayott? *A* It was 1935. I thought I gave that.

Trial Examiner: I just wanted to be sure.

[*1045*] *Q* Was the connection with the Connecticut Light and Power Company subsequently discontinued again? *A* In 1936.

Q Do you have the date of that? *A* In the excerpts from the Connecticut Valley Power Exchange, load control supervisor's report, for Thursday, May 28, 1936, Daylight Saving time—I will have to correct that. It was for Friday, May 29, 1936, Daylight Saving time, there is this item: "8:31 A.M., separating from Connecticut Light and Power Company, on account of Federal Utility Act."

Q What did you understand that to mean? *A* Only what it says.

Q Was the Connecticut Light and Power Company connection at New Britain with the Connecticut Power Company's lines subsequently restored? *A* I beg your pardon. May I have that again?

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: Not in 1936.

* * * * * * [*1047*]

By Mr. Wahrenbrock: *Q* In the operation of the Connecticut Valley Power Exchange, does the exchange schedule or direct the operation of [*1048*] the switching facilities at South Meadow? *A* It does not.

Q Does it submit a schedule to the Connecticut Power Company for the operation of those switching facilities? *A* It does not.

Q By whom is the operation of those switching facilities controlled? *A* By the load dispatcher of the Connecticut Power Company, under the direction of the Connecticut Power Company.

Q Where is the load dispatcher of the Connecticut Power Company—where does he operate—where is his office? *A* At the South Meadow station.

Q At the South Meadow station? *A* At the South Meadow station.

Q The South Meadow station of what company? *A* The South Meadow station of the Hartford Electric Light Company.

Q Is the load dispatcher of the Connecticut Power Company the same individual who is a load dispatcher of any other company? *A* I believe he is.

Q What other company?

Mr. Branch: I don't see what possible bearing that has on this, unless it is the Connecticut Power—Light and Power Company, which I am sure it isn't. It seems to me the [*1049*] question "Has he any connection with the Connecticut Light and Power Company"—

Trial Examiner: I think it is material if he is connected either with the Connecticut Light and Power Company or with the exchange.

Mr. Wahrenbrock: Is the objection sustained, Mr. Examiner?

Trial Examiner: It is in the present form of the question, yes.

By Mr. Wahrenbrock: *Q* Do you, as manager of the Connecticut Valley Power Exchange, keep yourself informed as to whether the CP-1 and CP-2 lines are in service during normal operations? *A* Yes.

Q I have been using the term "CP-1" and "CP-2", which is a company term. Will you describe what is meant by CP-1 and CP-2 lines? *A* Those designate certain transmission lines of the Connecticut Power Company.

Q Are they indicated on this Exhibit No. 38 for Identification? *A* Yes.

Q Will you show—will you point out where those CP-1 and CP-2 lines are shown on Exhibit No. 38 for Identification? *A* They are near the top of the sheet, shown running between the South Meadow substation of the Connecticut [*1050*] Power Company to their Falls Village generating station.

Q Is the South Meadow substation of the Connecticut Power Company the portion of this diagram that is indicated by the wording "Hartford South Meadow"? *A* I believe it is.

Q During normal operation of the exchange, are you familiar with the connections in the Connecticut Power Company substa-

tion? *A* We would know in a general way what they are. We have no supervision and no control over them.

Q Are both CP-1 and CP-2 lines used during normal operations? *A* I believe they are.

Q On this Exhibit No. 38 for Identification, in the substation which is marked "Hartford South Meadow", there is shown in the lower right-hand corner of the dotted line, which I take it indicates the area, or the boundary of the sub-station a transformer by the usual symbol for a transformer, and a notation, "7500 KVA self-cooled, 12,000 KVA forced cooled". Do you—

Mr. Branch: Wait just a minute. I don't follow you.

Trial Examiner: I suggest that Commission counsel suspend until respondent's counsel gets a little technical advice.

Mr. Wahrenbrock: I can appreciate the need for technical advice, having relied on it myself so heavily.

[*1051*] Mr. Branch: I am ready.

By Mr. Wahrenbrock: *Q* Do you see the transformer to which I am referring? *A* I believe I do.

Q I now wish to refer to two other transformers which are vertically directly above the indication of the transformer to which I have just referred, and—do you see the two additional transformer diagrams to which I refer? *A* I believe I do.

Q How is the circuit to the lowest of those three transformers designated? How do you identify it? Does it have a number? *A* I don't know as I understand your question on that.

Q Is that lowest transformer on circuit 124?

Trial Examiner: I think counsel will clarify the record if he will say lower on the diagram or whether he means—

By Mr. Wahrenbrock: *Q* I mean the one in the right-hand lower corner of the South—the Hartford South Meadow sub-station, on the diagram? *A* There are some numbered designations, but I wouldn't attempt to give you them from memory. I know they have some numbered designations for that particular—

Q You are familiar with the relative location of those three transformers, are you? [*1052*] *A* Yes.

Q And in general you are familiar with the circuits in which they operate? *A* In general, yes.

Trial Examiner: It seems to me, Mr. Wahrenbrock, you have material here in which some of this detail you are asking the witness might better be brought out by an employee of the Connecticut Power Company.

Mr. Wahrenbrock: I think we may be able to get entirely enough—in fact, I am sure we will be able to get enough for the purpose of further questions I have to put to the witness. I do propose to ask the more detailed questions of the Connecticut Power Company officials.

Trial Examiner: All right. You may proceed.

By Mr. Wahrenbrock: *Q* In the normal operation of the Exchange, are all three of those transformers in operation? *A* I believe they are.

Q Do you, in the operation of the Exchange, take into account the energy losses in those transformers? *A* In the transfer of energy?

Q Yes? *A* Yes.

Q In the normal operation of the Exchange, is the maximum economy achieved by the operation of those three [*1053*] transformers in parallel? *A* Possibly I might correct that earlier statement by saying that maximum reliability is also always taken into account in all of our operations, and that maximum reliability would be a determining factor in taking out any transformers to make savings.

Q Then do I understand from that that during normal operations, the three transformers are operated in parallel, and unless one of them is out of repair or has failed or is out of service? *A* I believe so.

Q In determining the economy of transmission of energy for the purposes of Exchange operation, what allowance do you make for energy losses in these three transformers?

* * * * * * [*1054*]

The Witness: We make no allowance for losses that would

occur if there were no Exchange transactions. We only make allowances for additional expenses incurred by Exchange transfers.

By Mr. Wahrenbrock: *Q* Yes. When there is an Exchange transfer, what allowance do you make, if any, for energy losses in the transformers? *A* I believe the only additional losses would be some copper losses.

Q What do you mean by "copper losses"? *A* Resistance losses caused by transfer of power over [*1055*] the transformer.

Mr. Branch: I did not hear the answer; may I have it read?

Trial Examiner: You may.

(The answer is read.)

By Mr. Wahrenbrock: *Q* That is resistance losses only. *A* The transformers would have to be in operation all the time, regardless of whether there was exchange or not.

Q Do I understand—this is technical, and I do not mean to lead, because I would be the last one in the world to lead here, because I would not know how to; but I want to know if the losses, other than the resistance losses, are negligible?

Mr. Branch: With that degree of modesty which is so characteristic of Mr. Wahrenbrock, I can hardly make objection to the question.

Trial Examiner: In view of that fact, the question will be permitted.

The Witness: I am afraid you are getting into a question of transformers and relative values, that I am not prepared to qualify on.

By Mr. Wahrenbrock: *Q* What I am trying to find out is whether, in the operation of the Exchange, when there are energy transactions through the transformers, in your determination of economical [*1056*] operation, you make any allowance for energy losses in these transformers? *A* We take all losses into account in determinations of all transfers.

Q What allowances do you make for energy losses in these

transformers? *A* The total losses when you are determining what the transfer will be.

Q What are the amounts of such losses in these transformers? *A* I am not prepared to say.

Q I would like to make a call for the witness to refresh his recollection over the week-end, as I did on a previous occasion. A little while ago you testified that in scheduling the operations of the Exchange—and I am sure you will correct me if I do not state this accurately—I state it from recollection, as I do not have the transcript before me,—in scheduling the operations of the Exchange, you took into account energy losses of transformers and transmission lines in determining whether a given source of energy should be called upon to supply a given load.

Mr. Branch: I object to that. That seems to be not only leading, but also going back into the very type of matter that the Examiner ruled would not be permitted now.

[*1057*] Trial Examiner: I think he was just making some statement as to what he took into account.

By Mr. Wahrenbrock: *Q* Do you recall stating that you took into account transmission line and transformer losses in scheduling the operations of the Exchange?

Trial Examiner: This has to do with operations, and not billing. It is not within what the Examiner ruled against.

Mr. Branch: Please note my exception.

Trial Examiner: Your objection will be noted and the objection is overruled. So far, I think we have merely a statement. Now, what do you propose to follow it with?

Mr. Wahrenbrock: I just am asking the witness whether he recalls that testimony.

The Witness: May I have the question read?

Trial Examiner: The question will be read back for the benefit of the witness.

(The question is read.)

The Witness: I did.

By Mr. Wahrenbrock: *Q* If there are losses of any significance in these transformers, they must be taken into account then in the operations of the Exchange? *A* They must, yes.

Q Can you determine from the records which are available [*1058*] to you, the allowances made for losses in these transformers? *A* I would have to go quite far back, because they are all used in arriving at the station results, and they are a part of that, and I would have to go back into those original calculations. Please do not ask me to get that by Monday.

Q From the same source, you could obtain the data as to the allowances made for energy losses in the two auto-transformers shown in the same substation on the diagram? *A* I am not sure how those have been handled in detail. They are part of the line.

Trial Examiner: I understood you wanted this witness to produce some information by Monday, or see whether he could furnish some information. I would like to clarify this point and complete the session.

Mr. Wahrenbrock: That is what I would like to do, Mr. Examiner. May I have the last statement made by the witness read?

(The record is read.)

By Mr. Wahrenbrock: *Q* Mr. Mayott, is it reasonable to ask you if you can have someone early Monday morning determine for you the transformer losses of each of these three two-winding transformers and the two auto-transformers, which are taken into account? *A* I would have to take that up with the Connecticut Power Company. They have the original data.

[*1059*] Trial Examiner: It seems to me it would be a great deal more practical proposition, Mr. Wahrenbrock, to have a witness here from the Connecticut Power Company, who will be able to state that.

By Mr. Wahrenbrock: *Q* As a matter of fact, Mr. Mayott, haven't you stated to the representatives of the staff of the Commission, or in a letter to the Commission that the energy losses in those transformers are negligible? *A* As far as the Exchange is concerned. I have already stated to you that the Exchange itself

has only used the additional losses incurred by the Exchange transactions.

Q And for those purposes, the transfer losses in these transformers may be neglected? *A* They may be neglected in certain cases.

* * * * * * [*1067*]

By Mr. Wahrenbrock: *Q* Mr. Mayott, in your previous testimony you have discussed the procedures of the Connecticut Valley Power Exchange in scheduling exchange operations, and you have referred, I believe, to a practice—I believe it was a daily practice—by which schedules of proposed operations were submitted by the exchange to the load dispatchers or proper representatives of the several companies involved for their consideration, and it was up to them to determine whether they would [*1068*] comply with the proposed schedule. Is that substantially correct? *A* That is substantially correct.

Q Now, I wish to inquire how the exchange learns when certain types of low cost, low incremental cost energy will be available?

Mr. Branch: I think I stated an objection to inquiry as to the objections of the exchange and its methods. I assume my general objection still holds and that it may be considered as being an objection to each question, without any interrupting at the end of the question.

Trial Examiner: I understand the objection is a general objection to matters dealing with the operations and the methods of the exchange.

Mr. Branch: That is right.

Trial Examiner: The objection is overruled and an exception is noted.

By Mr. Wahrenbrock: *Q* I wish to inquire for example, when one of the hydro plants in Massachusetts, such as Cabot, or Cobble Mountain or Gardner's Falls or Dwight station or No. 2 of the United Electric Light is going to spill water, how the exchange is apprised of that fact in order that it may schedule use of that excess energy if it has a place where it can be used. [*1069*] *A*

By keeping close record of what all the plants are doing, on an hour by hour basis, and by close contact with the man in charge of operations for the individual company.

Q Then when such a hydro plant foresees that it is going to have to spill water unless the exchange takes energy, does it telephone or otherwise quickly get in touch with the exchange? *A* It gets in touch with their—the man in charge of that particular company's operations, and he would get in touch with us.

Q And when you say he would get in touch with you, what would he tell you? *A* Conditions at that particular station.

Q Namely, that the particular plant had excess water, and could make it available for use by the exchange? *A* Yes. Of course, as I said, we are keeping in touch with the general situation hour by hour from the readings of the individual stations.

Q You keep yourself—the exchange keeps itself currently, hourly, informed as to the load being served by each of those stations, and the amount of water available at each? *A* Of the load on each station, and the amount of water available to each.

Q And the exchange is able to ascertain from that fact [*1070*] whether a particular hydro station will shortly be able to carry more of a load, or otherwise waste water? *A* Yes.

Mr. Wahrenbrock: Having handed a copy to respondent's counsel and to the Examiner, I direct the witness's attention to a sheet of paper which has been marked by the Federal Power Commission at the top, "Connecticut Valley Power Exchange Rate Schedule F.P.C. No. 1, Effective date, July 1, 1936", and has impressed on it the usual receipt stamp, "Federal Power Commission, July 8th, 1936, received", and ask you if the remainder of this document is a copy of an agreement that you recognize? *A* It is.

Mr. Wahrenbrock: I hand the document to the reporter for identification as Exhibit No. 39.

Trial Examiner: The reporter will mark the exhibit No. 39 for Identification.

(The document referred to was marked as Exhibit No. 39 for Identification.)

[*1071*] By Mr. Wahrenbrock: *Q* I show you the exhibit, No. 39 for Identification, and ask you to state what that is? *A* That shows the arrangement under which the Exchange operates and is signed by the three members of the present Connecticut Valley Exchange, consisting of the Connecticut Power, Turners Falls Power and Electric Company and the New England Power.

Q That is the presently effective arrangement under which the Exchange operates? *A* It is.

Q How long has the Exchange operated under this arrangement? *A* July 1, 1936.

Q Prior to July 1, 1936, under what kind of arrangement contract of agreement did the Exchange operate?

Mr. Branch: Excuse me, I did not hear that on account of the train. May I have it read?

Trial Examiner: Read the question back to Mr. Branch.

(The question was read by the reporter.)

A Under substantially the same arrangement, except for the period of the emergency in 1936.

By Mr. Wahrenbrock: *Q* Was that arrangement reduced to writing? *A* Yes, on several different reports and publications.

* * * * * * [*1072*]

Q Will you give the dates of those several written instruments? *A* I wouldn't attempt to without checking back.

Q Will you give the dates of such of them as you recall? *A* I can't recall any particular dates. There was quite a lot written on the Exchange both by the Exchange and by others.

Q I refer to the agreements under which electric energy was exchanged, and if you can't give the exact dates, will you tell in what year the agreements were made? *A* Well, the first agreement was made in 1935.

Q 1935? *A* 1925, I beg your pardon.

Q Was that agreement in writing? *A* I dont' believe that was made in writing and signed. There were various drafts made, but it was not signed like this was signed.

* * * * * * [*1080*]

Q Was there an agreement dated on or about January 1, 1931, between the Hartford Electric Light Company, the Connecticut Power Company, and the Connecticut Light and Power Company, under which, or pursuant to which, electric energy was exchanged by the so-called Connecticut Valley Exchange, immediately prior to the disconnections in 1935? *A* There was an agreement between the Hartford Electric Light Company and the Connecticut Power Company as to exchange. The exchange, however, has no first-hand knowledge of any agreement as to capital investment, or any other contract as between the companies themselves. All I might give is hearsay, and I am not prepared to even give that on such a contract as you have stated.

* * * * * * [*1083*]

Q You don't know whether there was an agreement about January 1, 1931, between the Connecticut Power Company and the Hartford Electric Light Company and the Connecticut Light and Power Company?

Mr. Branch: I object. I think the witness has stated what he knows. If we want to get facts, why not get at them? I object to this witness being asked a question over and over again. It seems to me he has answered the question and there is no necessity for pursuing the matter any further, no propriety in this question.

Trial Examiner: I will permit the witness to answer the question. I don't think it has been answered in these terms.

The Witness: Please repeat the question.

(Question read by the reporter.)

A The Exchange has nothing to do with contracts, as between companies. I sometimes hear of contracts that are being made and sometimes I do not. As to their terms, I have nothing to do with such terms. You have asked me a certain date. I am unable to recall.

Q Mr. Mayott, isn't it a fact that at and immediately prior to the time of the disconnections in 1935 the Connecticut Valley

Power Exchange, of which you were the manager, was operating under the agreement of January 1, 1931, between the three companies to which I have referred? [*1084*] *A* As I understand it, that was entirely an agreement as to the use of lines as between companies and the payment of capital charges, which do not come under the Exchange at all.

Q Could the Exchange have operated without such an agreement? *A* If I recall what you said rightly, I would say that we are at present operating the Exchange without a corresponding agreement.

Q Could the Exchange have operated, immediately prior to the disconnections in 1935, without an agreement whereby the Hartford-Agawam line and the other lines of the Connecticut Power Company were available for the interchange of electric energy between the Connecticut Power Company, the Hartford Electric Light Company, and the Connecticut Light and Power Company? *A* It was necessary to use the lines of the Connecticut Power Company to conduct such Exchange operations.

Q And it was necessary that the Connecticut Power Company make those lines available? *A* It was necessary that the Connecticut Power Company make those lines available.

* * * * * * [*1086*]

Q Who were the members of the Connecticut Valley Power Exchange immediately prior to the disconnections about August 25th, 1935?

Mr. Branch: Of course, my objection goes to all of this.

Trial Examiner: You may answer the question.

A The Connecticut Light and Power, the Hartford Electric Light and the Turners Falls Power and Electric Company.

Q What was the position of the Connecticut Power Company in the Exchange? *A* The Connecticut Power Company's lines were used for transmission of power.

Q Did it receive a toll for that use of its lines, or a payment? *A* I believe it did.

Q Why were the Hartford-Agawam and the E-lines disconnected in August of 1935?

Mr. Branch: Well, I assume that this question, of course, [*1087*] calls only for the witness's own first hand knowledge if he has it.

Trial Examiner: That is right, if he knows.

A Because they were ordered open by the officials of the Connecticut Power Company.

By Mr. Wahrenbrock: *Q* By which officials? *A* I believe the President, Mr. Ferguson.

Q Did Mr. Ferguson explain to you at any time the reasons for opening those lines?

Trial Examiner: Isn't Mr. Ferguson under subpoena?

Mr. Wahrenbrock: Yes.

Trial Examiner: Perhaps this information better be received from him and save time here.

By Mr. Wahrenbrock: *Q* Were you informed of the reasons for the disconnections? *A* Well, it was generally discussed that the reason was to open them before the Utility Act came into effect.

Q Why, if you know, did the Connecticut Light and Power Company disconnect at New Britain, about the same time?

Mr. Branch: I think the sources of his knowledge ought to appear, if he has them.

Trial Examiner: I think they should appear very definitely, how he knows.

[*1088*] By Mr. Wahrenbrock: *Q* Were you informed by any officials or representatives of the Connecticut Light and Power Company as to their reasons for the disconnection at New Britain, about the same time?

Mr. Branch: Well, I think it should appear that the witness is asked, or ought to be asked, at least, only about conversations or communications he had with officers of the Connecticut Light and Power Company.

Trial Examiner: Well, this is the first question of what I presume to be a group of questions to bring that out, Mr. Branch. I think the counsel should be relieved that the questions are placed in more simple form, and not all in one question. You may answer.

A As I recall, the first knowledge I had that they were going to disconnect came from their Chief Load Dispatcher to my Load Supervisor, who reported it to me.

By Mr. Wahrenbrock: *Q* When was that? *A* That was Saturday, August 24th, 1935, and the note was at 8:55 A.M.

* * * * * * [*1089*]

Q Were records currently made and preserved under your direction, recording the events which took place on the 24th, 25th and 26th of August, 1935, with respect to these several disconnections? *A* They were.

* * * * * * [*1092*]

Q I will ask you what the original is, of which this is a copy? *A* It was a memoranda taken from the various notes that I made or had made during the disconnection of the lines, from the period of August 24th to the 26th.

* * * * * * [*1093*]

Mr. Wahrenbrock: May it be marked for identification Exhibit No. 40?

Trial Examiner: It may be marked for identification as Exhibit No. 40.

(The document referred to was marked as Exhibit Number 40 for Identification.)

* * * * * * [*1095*]

Q Now, just a few questions so that we may understand the references in this Exhibit No. 40. Who is Mr. Day therein referred to? *A* He was vice-president of the Connecticut Light and Power Company.

Q What was his full name? *A* I believe it was I. W. Day.

Q Who is the R. H. B. that is referred to in the first line? *A* That was one of my load supervisors.

Q Working under your direction? *A* Under my direction.

Q Who was Mr. Applegate? *A* General manager at the Hartford Electric Light Company.

Q Who was Mr. Colvin? *A* Vice-president of the Connecticut Power Company.

Q Who was Mr. Whiting? *A* I believe his title is manager of the Canaan division of the Connecticut Power Company.

Trial Examiner: Do I understand the witness to refer to the present title of this party? I would suggest—

The Witness: As far as possible, I am giving the title at the time this was written.

[*1096*] Trial Examiner: That is what I wanted to suggest. I think the record should show what they were at that time.

Mr. Wahrenbrock: *Q* Who was Mr. Hunt? *A* Vice-president of the Turners Falls Power and Electric Company.

Q Who was Mr. Mosher? *A* General superintendent of the Turners Falls Power and Electric Company.

Q Who was Mr. McKearin—M-c-K-e-a-r-i-n—perhaps I don't pronounce that correct? *A* He was engineer for the United Electric Light Company.

Q And who was Mr. Corey? *A* He was chief load dispatcher of the New England Power Company.

Q And the Mr. Mayott referred to in the third paragraph is yourself? *A* Myself.

Q What is the "E" line that is referred to? *A* The "E" line is the line that goes from Falls Village, Connecticut, on the Connecticut Power system, to the Central Hudson Gas and Electric Company system at Poughkeepsie.

Q Who is Mr. A. T. Gray? Who was Mr. A. T. Gray, referred to in the tenth paragraph? *A* He had charge of the dispatching for the Central [*1097*] Hudson Gas and Electric Company. I don't recall his title at this particular time.

Q Who was Yale? *A* Superintendent of distribution for the Hartford Electric Light Company.

Q Mr. Ferguson was Mr. Samuel Ferguson? *A* He was.

Q What was his position at that time? *A* He was president of the Connecticut Power Company.

Q And who was the Mr. Lawrence that is referred to? *A* President of the Turners Falls Power and Electric Company.

Q Who was Mr. Bell that is referred to at the bottom of the first page? *A* Assistant vice-president of the New England Power Company.

Q What does it mean when the statement occurs, "Cutting loops", or "open loops"? *A* My understanding of that is that it was cutting that portion of the transmission line that goes between the two sets of strain insulators on a strain tower.

Q The effect is to break the circuit by cutting a single wire, making a single cut in a wire? *A* Making a single cut in the wire at that particular place.

[*1098*] *Q* And thereby breaking the circuit? *A* Breaking the circuit.

* * * * * * [*1102*]

Q Mr. Mayott, does the maintenance of voltage and the maintenance of a good power factor by the operation of synchronous condensers at the Connecticut Power Company's delivery points on C. P. 1 and C. P. 2, make a more economical operation of those transmission lines possible?

* * * * * * [*1103*]

A Those particular phases are outside of my jurisdiction. I should offhand say that it does cut down the losses somewhat, but I am not prepared to say or to even give any facts on them.

By Mr. Wahrenbrock: *Q* Does the maintenance of voltage and power factor by the operation of synchronous condensers at the Connecticut Power Company's delivery points on the C. P. 1 and C. P. 2 lines increase the capacity of those lines?

* * * * * * [*1104*]

A I believe it does, somewhat.

By Mr. Wahrenbrock: *Q* As manager of the Connecticut Valley Power Exchange, you have to consider the economy of the operation of those lines, do you not?

Mr. Wahrenbrock: I will reframe that question.

By Mr. Wahrenbrock: *Q* You have to take into account the efficiency of the operations of those lines? *A* We do, at times.

Q You have to take into account losses on those lines, [*1105*] do you not? *A* We do.

Q If there were excessive voltage drops on those lines, that would affect the efficiency of the line, would it not? *A* Yes.

Q If there were excessive voltage drops on those lines, would the Exchange be able to transmit as much electric energy over those lines as it could if voltage were properly maintained on the lines? *A* The Exchange can only use such facilities as the companies make available to them without jeopardy to their own loads, their own operation.

Q I don't believe that answers my question. May the question be read?

(The question is read by the reporter.)

A I thought I answered the question.

Trial Examiner: The answer does not appear to me to be responsive to the question.

A (Continuing) We don't transmit as much power over the lines if the lines were heavily loaded as we could if there was more capacity of lines available.

Q Does then the maintenance of voltage and power factor by the operation of synchronous condensers, as I have referred to it, make available increased capacities for the operation of the Exchange? [*1106*] *A* I believe it does, to some extent.

Q Mr. Mayott, did you state in your testimony Saturday that in the operation of the Exchange you considered, in addition to the incremental cost of energy available, the cost of transmitting the energy? *A* I did.

Q Would the operation of synchronous condensers at the delivery points, to which I have referred, affect the cost of transmission of energy? *A* They would.

Q Then it is within the scope of your duties to ascertain costs of transmission, as affected by the operation of those synchronous condensers? *A* The operation of the synchronous condensers is entirely outside of the control of the Exchange. We take the data as they give it and we use that in the Exchange calculations. We have nothing to do with the operation of any of the synchronous equipment. That is entirely within the jurisdiction of the dispatcher for that system.

Q Now, that wasn't my question, Mr. Mayott.

Mr. Wahrenbrock: May I have the question read, please?

(Question read by the reporter.)

A No, we don't figure the cost of operation as affected by the synchronous condensers.

Q As a matter of fact, you do consider the costs of [*1107*] operation, assuming the maintenance of certain power factors and voltage regulation, do you not? *A* That is a study that is almost beyond the Exchange. We sometimes get into a little of that, but that maintenance of voltage is up to the dispatchers for the individual systems.

Q I am not questioning about whose duty it is to maintain the voltage, but I am asking you whether the maintenance of voltage and the power factor is not a basis upon which you make your determinations of transmission costs? *A* The maintenance of voltage doesn't come into the question of costs. We use the actual line losses, that is, the line losses for different loads. We can assume that they are going to maintain their voltage.

Q Isn't the amount of line losses dependent upon the power factor and the voltage regulation? *A* It is.

Q Mr. Mayott, do I understand you to state that the Exchange is not interested in the effect of the operation of synchronous condensers on their line losses? *A* We are interested in line losses,

but we have to take them as they are. We have no control over how they are taken care of by the companies.

Q You are interested in the effect of the operation of synchronous condensers on those line losses, are you not? *A* Will you read the question back?

[*1108*] (Question read by the reporter.)

A To tell you frankly, we have never made any study by the Exchange, that I know of, as to the actual effect of the line losses by synchronous condensers. We of course are all interested in keeping losses down to a minimum, but that particular phase of it has never come into the Exchange calculations.

Q Well, would the Exchange continue its operations in the same way if there were a failure to maintain proper voltage and power factor regulation on the C. P. 1 and C. P. 2 lines? *A* Frankly, I believe it would have very, very little effect upon the Exchange, at the present time.

Q Is the matter of maintenance of power factor and voltage regulation a matter of indifference to the Exchange? *A* No.

Q In scheduling the use of distant available waste power or dump power, don't you consider the line losses that would result from the use of that power? *A* Yes.

Q And wouldn't those line losses be affected by the power factor and the voltage regulation? *A* They would have some little effect on transfer, at the present time; that I would hesitate to say.

Q Well, do you mean to say that the Connecticut Valley [*1109*] Power Exchange could continue its present operations in the same way if the synchronous condensers were not in operation? *A* They have so little effect on the present operation of the Connecticut Valley Power Exchange that it would show no effect in the Connecticut Valley Power Exchange savings, net savings, at the present time.

[*1110*] *Q* Well now, why do you limit that to the present time? *A* Well, any time since 1935—or 1936, I should say.

Q Have you made calculations to determine the amount of such

effects? *A* No. I am giving you my opinion on that particular thing.

Q What are those synchronous condensers there for?

Mr. Branch: Where?

Mr. Wahrenbrock: The synchronous condensers operated at the various delivery points of the Connecticut Power Company on the CP-1 and CP-2 lines.

Mr. Branch: I think it would have to appear that the witness knows where those synchronous condensers are.

By Mr. Wahrenbrock: *Q* Do you know if there are synchronous condensers at the several points at which the Connecticut Power Company delivers energy from the CP-1 and CP-2 lines? *A* I know there are synchronous condensers.

Mr. Wahrenbrock: Now, I ask the reporter to read my original question back to the witness.

Trial Examiner: The reporter may read the question.

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: That is entirely outside of my jurisdiction. [*1111*] I could tell you what I thought they were there for.

By Mr. Wahrenbrock: *Q* As a matter of fact, you know what they are there for, don't you? *A* Indirectly.

Q You know what they are there for?

Mr. Branch: Well, I think this is improper. The witness has made a statement of which I think is a proper one, that it is out of his jurisdiction. He thinks he knows what they are there for, and it seems to me that this kind of questioning is improper.

Trial Examiner: I think the information may well be obtained from technical witnesses. If the witness only thinks and doesn't know, and it is said they are not within his province, that seems to be a sufficient answer to the question.

By Mr. Wahrenbrock: *Q* Mr. Mayott, are you an engineer? *A* I am an engineer.

Q Were you trained as an engineer? *A* I was educated as an engineer.

Q What school? *A* Rensselaer Polytechnic Institute.

Q What year did you graduate? *A* I graduated in 1911.

Q What degree did you obtain? [*1112*] *A* Electrical engineering.

Q Did you work as an engineer subsequent to that time? *A* What?

Q Did you work as an electrical engineer subsequent to that time? *A* Except for four years when I acted as a mechanical engineer, I worked in the operating division. I never worked as a pure electrical engineer.

Q How long have you been with the Hartford Electric Light Company? *A* Since 1925.

Mr. Branch: Well—

By Mr. Wahrenbrock: *Q* Since 1925? *A* Since 1925.

Trial Examiner: Did you have an objection to raise?

Mr. Branch: I don't know, it seems to me—how long have you been—it seems to me he was employed at one time by them, but not at the present time.

Trial Examiner: I think the question rather assumes that he is presently employed at the Hartford Electric Light Company, and I thought perhaps that was the objection. I would like to have you clarify that.

By Mr. Wahrenbrock: *Q* Have you recently completed 25 years of service with [*1113*] Hartford Electric Light Company? *A* I have been on the payroll of the Hartford Electric Light Company for 30 years.

Q And prior to your work for the Connecticut Valley Power Exchange, was your work of an engineering nature? *A* It was not. It was operating, except for about four years when it was more mechanical engineering.

Q As an electrical engineer, you are familiar with the operation of synchronous condensers, are you? *A* I am.

Mr. Wahrenbrock: I now wish to ask the reporter to read the question to which Mr. Branch objected, and ask that that question be given.

(Whereupon the question as above recorded, was read by the reporter.)

Mr. Branch: Is that a question?

Trial Examiner: It may be if you put a question mark after it.

Mr. Wahrenbrock: I will ask Mr. Mayott the question—

By Mr. Wahrenbrock: *Q* Do you know what those condensers at the several delivery points on the CP-1 and CP-2 lines are there for? *A* Well, I should assume they are there to maintain the voltage at the various substations. However, there are several other ways of accomplishing the same thing, and as an [*1114*] engineer, I haven't been into that particular phase of the determination as to why—why they were put there.

By Mr. Wahrenbrock: *Q* Well, that maintenance of voltage and power factor materially affects the capacity of the CP-1 and CP-2 lines? *A* I am unable to say without calculation.

Q But you would expect that it would, would you not? *A* I would expect that it would have some effect. The total amount of that effect, I couldn't say without a study.

Q Now, can you predict the effect of the recommendations you make as to exchange operations, without taking into account the effect of alternate apparatus in the several systems, on the economy of the exchange operations, including the synchronous condensers? *A* We never had to go as close as that in any of our operations.

Q Aren't calculations on that point included in the basic data on which your exchange operations are set up? *A* Not that close.

Q Aren't those basic data based on assumptions as to power factor and voltage regulations which are to be maintained? *A* We always operate on the basis that the dispatchers on their own systems will maintain their proper voltage, and if the operations are affecting that voltage, we have to make changes in the loading.

[*1115*] *Q* Does that complete your answer? *A* Well, does that give you what you wish?

Mr. Wahrenbrock: May the reporter read the question and the answer, please?

Trial Examiner: The reporter may read the question and the answer.

(Whereupon the last question and answer as above recorded, were read by the reporter.)

By Mr. Wahrenbrock: *Q* Then the basic data upon which your exchange operations take place do assume the maintenance of power factor and voltage regulations? *A* The maintenance of proper voltage on the systems. We never have operated on the basis of power factor. We take account of reactive transfer, if it is excessive.

Q Then do I understand that in the way you proceed it is necessary for you to experiment and see whether the operations which you schedule can maintain voltage? *A* We know from past experience what to expect. If there are any unusual conditions we have to take care of them at the particular time they do occur.

Q And from that past experience, have you determined that the maintenance of voltage is necessary to exchange operations? *A* Well, we know that the companies have got to maintain [*1116*] their proper voltage for their own operations.

Q An do you know they have to maintain it for your operations? *A* We know that our operations cannot be allowed to interfere with that proper voltage.

Q And do you know that you could not operate if they did not maintain proper voltage, in the way in which you do operate? *A* We know definitely that if our operation interferes with the maintenance of their voltage and the maintenance of safe conditions under their system, that we wouldn't have the transfer.

Q So that, the maintenance of proper voltage is essential to the transfers which your Exchange makes?

Mr. Branch: I object. I think he is leading the witness beyond any reasonable proper bounds.

Trial Examiner: It seems to me that the witness has appeared to find difficulty in answering the question directly, which I think in this case will justify somewhat of a leading question. I will permit the question.

Mr. Wahrenbrock: Will the reporter read the question, please?

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: That is correct.

[*1117*] By Mr. Wahrenbrock: *Q* And do the companies which receive energy at the delivery points on the CP-1 and CP-2 lines operate synchronous condensers in order to maintain that voltage?

Mr. Branch: I object because I think the witness has already said he does not know.

Trial Examiner: I think the question involves a knowledge as to the purpose of the companies, and there being no evidence that they have ever communicated to him their purpose—

Mr. Wahrenbrock: Mr. Examiner, it is a matter of—

Trial Examiner: You lay that ground.

Mr. Wahrenbrock: It is a matter of engineering knowledge that—

Trial Examiner: The purpose is not a matter of engineering knowledge.

Mr. Wahrenbrock: The purpose of certain facilities is a matter of engineering knowledge. It is not a matter of subjective intent.

Trial Examiner: With that understanding, that that is the way the witness understands the question, he may proceed.

Mr. Wahrenbrock: May the question be repeated?

Trial Examiner: Certainly the question as worded indicated that he has a knowledge of the purpose in mind. I suggest the question be reworded.

By Mr. Wahrenbrock: [*1118*] *Q* Do the synchronous condensers which are maintained at the delivery points from the CP-1 and CP-2 lines serve to maintain the voltage at those points? *A* As I understand it, they serve to maintain the voltage within the individual section.

Q Did you say section or center? *A* Individual sections, individual substations, within the individual substation rather than the section.

Q And it is the maintenance of that voltage which you previously said was essential in order that Exchange transfers might take place? *A* No, I said it was essential that the voltage in the transmission lines be maintained on the transmission lines.

Q Be maintained on the transmission lines to correspond to what? *A* What?

Q Be maintained at what point? *A* At the proper level, whatever that might be, for each individual section.

Q And when energy is being transferred, the transmission lines and the substations are interconnected, are they not? *A* They are interconnected, yes.

Q With respect to the three power transformers, the two-winding transformers, at the Connecticut Power Company's [*1119*] South Meadow's Substation, to which we were referring in our questions and answers Saturday morning, are you able to state now the approximate efficiency of those transformers at full load? *A* I can give you such data as I happen to have at the Exchange.

Q Will you do so? *A* This data has not been approved by the Connecticut Power Company, nor checked by me against their data, to date. It is data that we had there and I believe it is approximately correct. You wish the efficiency at full load?

Mr. Branch: May it please the Examiner, I don't know what the purpose of this is, or how material it is, but if it is of any importance I should feel that on the statement of this witness this information would not be the information which we ought to have, but rather some information that has been checked, or something that comes from some source which this witness could be certain of.

Mr. Wahrenbrock: Mr. Examiner, in view of the witness's concluding phrase, I believe it is admissible.

Mr. Branch: He just says it is something they have and it hasn't been checked by him, and it doesn't come from the Connecticut Power Company.

Mr. Wahrenbrock: That isn't all he says.

* * * * * * [*1123*]

Q Will you state what the efficiency of those transformers is? *A* I have checked with the specifications of the transformers, as given by the manufacturer, and on those specifications I find that the efficiency at full load of the 12,000 [*1124*] KVA transformer is 99.1 per cent and for the 7,500 KVA transformer, the efficiency at full load is 99.0 per cent.

Q You have given two types of transformers. Which type is it of which there are two? *A* The 7,500 KVA transformer.

Q Are you able to state which feeders those two types are on? *A* I believe that Feeder 122 goes to the 12,000 KVA transformer and 123 and 124 go to the 7,500 KVA transformer.

Q Respectively? *A* Respectively.

[*1125*] *Q* Have you the information as to the core losses in those transformers at no load? *A* I could find nothing on the specifications that would give the no load or core losses on the 12,000 KVA transformer. Somewheres I had obtained a figure of 39 kilowatts as being that loss, but I can't vouch for that. On the 7500 KVA transformers, the specifications give 32.2 kilowatts as the no load losses, or the core losses.

Q For each transformer? *A* For each transformer.

Q Do you know what the exciting current is on each of those transformers? *A* I do not.

Q How do those three transformers divide the load among them under normal operating conditions? *A* I had that checked, and apparently they divide the load in proportion to their capacity.

Mr. Wahrenbrock: Mr. Examiner, I am a little vague in my recollection of what the situation is with respect to the next question I am going to put. I seem to recall that it has been put and it was the subject of some colloquy, but I am going to put it again to clear the matter up.

By Mr. Wahrenbrock: *Q* Will you state all of the instances subsequent to the disconnections about August 25, 1935, of recon-

nections of [*1126*] the Connecticut Light and Power Company's connection to the CP-1 and CP-2 lines at New Britain. *A* As stated in my previous testimony, the No. 2 CP line was taken out of service between point 12 and 474, to reconnect at New Britain at 1:07 P.M., Tuesday, August 27, 1935. That is Daylight Savings Time. I found on checking that the actual time of phasing at New Britain was at 2:59 P.M., August 27, 1935.

Q Now, will you explain what you mean by actual time of phasing, for the record? *A* The difference between the two times is the time it took to do the work of reconnecting after the No. 2 line was made available to them at 1:07.

Q And the latter time represents the actual completion? *A* The actual completion, and putting the two systems back together again.

Q Over that interconnection? *A* Over that interconnection. That, aside from ordinary switching, which might have occurred, between that time and Friday, May 29, 1936—

Q Excuse me before you go on. You have only described the reconnection of one circuit. Can you state when the other circuit was reconnected or was it reconnected? *A* The other circuit was reconnected, but I haven't the time that it was reconnected. It was probably reconnected [*1127*] a short time after that No. 2 was reconnected.

Q Thank you.

The Witness: Will you please repeat what I had said there?

(Whereupon the question as above recorded, was read by the reporter.)

The Witness: The Connecticut Light and Power was cut away at 8:29 A.M. on the 29th of May. They remained cut away from the system till the hurricane emergency in 1938. Due to the emergency—due to the hurricane, the Hartford Agawam lines were put out of service. At 9:55 A.M. on Thursday, September 22, 1938, Daylight Savings Time, there is this note in the load supervisor's report: "9:55 A.M. After consultation with J. Orr, I requested

J. E. King, of the Connecticut Light and Power at Waterbury to reconnect the New Britain tap to the Connecticut Power Company's lines under emergency conditions due to the flood on the Connecticut River." That is signed "C. W. M.", which I recognize as my note.

On Friday, September 23, 1938, Daylight Savings Time, at 1:45 A.M., there is this note: "Hickok, at Waterbury, reported that C.L.P. phased with Connecticut Power Company at New Britain, at 10:39 A.M., over No. 2 Connecticut Power Company line."

On Wednesday, September 28, 1938, at 3:20 P.M., Daylight Savings Time, there is this note: "As per agreement with [*1128*] Mr. T. T. Zorn, of the Connecticut Power Company, I notified Mr. J. E. King, of the Connecticut Light and Power Company, that the Hartford Agawam line would probably be back in service this P.M. As soon as the lines are in and we are satisfied they are O.K., the New Britain connections will be opened. This will terminate the emergency." That is signed, "C. W. M.", which is myself.

On Wednesday, September 28, 1938, at 9:40 P.M., Daylight Savings time, is this note: "New Britain operator reports the cut away from the CP line at 9:37 P.M. Reported this to the Hartford load dispatcher."

During this period, there was no power transferred to the Connecticut Light and Power Company. Such power as was transferred came entirely from the Connecticut Light and Power Company to the Connecticut Power Company on an emergency basis. Aside from those times, there are no—there have been no reconnections, to the best of my knowledge and belief, at New Britain.

Q Since August 25, 1935? *A* Yes, since August 25, 1935, except for those two times as noted.

[*1129*] *Q* After the disconnection at New Britain in 1936, did the Connecticut Valley Power Exchange begin its formal operations, according to the principles you have explained as being the principles on which it operates? *A* As far as possible, taking into

account the emergency which did not terminate until the latter part of that year.

Q And from that termination of the emergency to which you have referred, on, the operations on the Exchange were conducted according to the plan of operation you have explained? *A* Yes.

Q Until the hurricane in '38? *A* Until the hurricane in '38.

Q Then after the hurricane in '38 and after the disconnection at New Britain at that time, did the Exchange resume its normal operations, according to the plan you have discussed? *A* Yes.

* * * * * * [*1132*]

Q Does energy received at the Connecticut Power Company's South Meadow substation from the Hartford-Agawam line, when delivered to the Hartford Electric Light Company, enter the facilities of the Hartford Company over feeders 122, 123 and 124? *A* It does.

Mr. Branch: I object. I don't think that those numbers mean anything to us yet.

Trial Examiner: I understood that those numbers referred to numbers on this diagram. Is that correct?

By Mr. Wahrenbrock: *Q* Are those the same feeders which have been referred to from Exhibit 38 for Identification? *A* There are no such numbers on 38, as I can see.

Q Are those three feeders the three feeders to the three two-winding power transformers to which you have previously referred in your testimony? *A* They are.

* * * * * * [*1133*]

Q Is electric energy received by the Hartford Electric Light Company from the Hartford-Agawam lines by means of the three circuits shown on Exhibit No. 38 for Identification in the lower right-hand and middle right-hand portions of the Hartford South Meadows Substation? *A* Yes.

Q And your answer refers, and was true as of all times from August 25, 1935 up until a period within the last two or three

months, is it not? *A* No, because they were not connected until 1936.

Q From '36. Thank you. From the connection at the State boundary in '36 up until recently? [*1134*] *A* Correct.

* * * * * *

Q Did the circuits to which you have referred include those three two-winding power transformers whose efficiency you described? *A* They do.

* * * * * * [*1135*]

Cross Examination by Mr. BRANCH.

Q Mr. Mayott, there has been some mention of synchronous condensers. Do you understand that there is a synchronous condenser at the substation of the Connecticut Light and Power Company in Bristol? *A* I so understand.

Q Would the removal of that synchronous condenser have any effect upon the operations of the Connecticut Valley Power Exchange? *A* I don't believe it would.

Q Would the removal of that condenser, in your opinion, have any substantial effect upon the maintenance of the voltage on the CP line?

Mr. Wahrenbrock: May I have the question read before it is answered?

Trial Examiner: You may. The reporter will read the question for the benefit of Commission's counsel.

(Whereupon the last question as above recorded, was read by the reporter.)

Mr. Wahrenbrock: May it be understood, under normal operating conditions when energy is flowing over the CP lines to the Bristol substation? Without that, I object to the question.

Trial Examiner: Is that the understanding?

[*1136*] Mr. Branch: Yes.

Trial Examiner: The witness may answer.

The Witness: It would have no effect on the voltage on the CP lines.

By Mr. Branch: *Q* Mr. Mayott, I have just one or two other questions to ask you. Do you know whether there was a synchronous condenser in the substation at Bristol before the Hartford-Agawam line was constructed? *A* It is my recollection that there was.

Q When was the Agawam line disconnected first?

Mr. Wahrenbrock: Mr. Examiner, on cross-examination Commission's counsel was not allowed to go into the question of the return on the investment in that line, and it strikes me this is outside of the scope that I was allowed to go into on direct.

Mr. Branch: You went into the matter of these disconnections in great detail.

Trial Examiner: I think this goes to the mechanics, not to the question of cost of operations. It will be permitted. Read the question back to the witness.

Mr. Wahrenbrock: If the question is to be read, may the understanding which I expressed, and which was accepted by respondent's counsel also be read?

Trial Examiner: Well—

[*1137*] Mr. Wahrenbrock: I beg your pardon? That was to the previous question.

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: In the excerpts from the Connecticut Valley Power Exchange load control supervisor's report for Sunday, August 25, 1935, there is this statement: "At 12:10"—I will take that back. "Called Hartford load dispatcher. He reported the CP line was cut out at Agawam, at 9:47-1/2 A.M. The 4 line cut out at Agawam at 10 A.M." Both Daylight Savings time.

By Mr. Branch: *Q* What day was that, Mr. Mayott? *A* Sunday, August 25, 1935.

Q Then, on Sunday, August 25, 1935, both circuits that ran north from Hartford into Massachusetts were actually severed at or near the State line? *A* They were actually severed at the State line.

Q Excuse me. Had you finished? *A* Yes.

Q Now, the line that runs from Falls Village to the New York State line, and sent on to Poughkeepsie, New York, is known, at least a part of it, between Falls Village and the New York State line, as the "E" line, is it not? *A* It is.

[*1138*] *Q* And was that line actually severed at or about the same time that the Agawam line was severed? *A* In the notes that I have which were taken from my own—kept for my own benefit—I have this note for August the 24th: "At 6:20 P.M., E line cut out on Connecticut side of Indian Lake, and at 6:00 P.M., loop opened on Central Hudson side of Indian Lake.

Q What does "loop opened" indicate? Is that something in the nature of a disconnection? *A* It is disconnection at a strain tower.

Q Now, that was also 1935, August 24th? *A* That was Saturday, August 24, 1935.

Q Was either the line to Agawam or the line to New York State, which you have called the "E" line connected again until the time of the hurricane in 1938? *A* Yes.

Q What time was it first connected? *A* They were connected —they were reconnected at the time of the flood in 1936, in March.

Q Well, they remained disconnected, both of them remained disconnected from August 24, 1935, to the time of the flood in March, 1936? *A* They did.

Q Mr. Mayott, I think that you have said, or at least indicated, that at times the Hartford Electric Light Company [*1139*] has received energy from the Connecticut Power Company substation just outside of the South Meadow plant in Hartford, is that correct? *A* That is correct.

Q And is it true that at all such times the South Meadow plant of the Hartford Electric Light Company was generating energy? *A* To the best of my knowledge and belief, it was.

Q And is it true then that the bus bar of the South Meadow

station consequently is energized from both of these sources at all times that Hartford is receiving energy from the Connecticut Power Company substation outside of the South Meadow plant? *A* It is.

Q Mr. Mayott, has there ever been generated at any plant any specific earmarked block of power or energy for the Connecticut Power Company, or for use in the exchange?

Mr. Wahrenbrock: Mr. Examiner, I object to the indefiniteness of the question. I don't understand about "earmarked power". I never saw ears on power. I state it that way to make it explicit that there is no showing in the record yet that power can be identified, so there is no point in asking a witness whether identified power was handled.

Trial Examiner: Your point is that it is not responsive—[*1140*] that the cross-examination is not responsive to anything taken up in direct examination?

Mr. Wahrenbrock: That is right.

Trial Examiner: I think that is rather obvious that this does not respond to anything developed on direct examination.

Mr. Branch: Well, as long as I am going to recall the witness anyway, I won't take time to press that matter.

By Mr. Branch: *Q* Mr. Mayott, is any firm capacity on the part of any generating plant involved in the operation of the Connecticut Valley Power Exchange?

Mr. Wahrenbrock: Mr. Examiner, I object, until the word "involved" is defined, and made certain and definite.

Trial Examiner: I think perhaps the word "involved" might be cleared up a little. It is a pretty general word.

By Mr. Branch: *Q* Does the operation of the Connecticut Valley Power Exchange call for any firm capacity on the part of any generating plant? *A* It does not.

Q And has it ever called for any such firm capacity? *A* It has not.

Q Except during some emergency, has the South Meadow plant

at Hartford always generated energy since August 26th, [*1141*] at least ? *A* I am very sure it has.

* * * * * * [*1148*]

Redirect Examination by Mr. WAHRENBROCK.

Q Mr. Mayott, with a peak load on the Bristol substation and the C. P. lines as well, and the Bristol synchronous condenser appropriately adjusted for that condition, if that synchronous condenser were suddenly disconnected, would there be any effects on the indications of the volt-meters on the line at Bristol? *A* There probably would be some indications at Bristol, particularly on the low side of the transformer.

Q What would that effect on the voltage be, to raise it or to lower it? *A* It would probably lower it.

Q Has the operation of the Connecticut Valley Power Exchange called for the maintenance by each member of such firm capacity to supply its own commitments? *A* It has.

Q Does the ability of the Connecticut Power Company to provide power for the Exchange depend upon the firm commitment it has from the Hartford Electric Light Company for capacity? *A* May I have that read again, please?

(Question read by the reporter.)

A I believe I will have to qualify that by saying that the firm commitment by the Hartford Electric Light Company to [*1149*] the Connecticut Power Company does not take into account any power for the Exchange. The demand charge has nothing to do with the Exchange. The Hartford Electric Light Company will supply such kilowatt hours as the Connecticut Power Company draws upon it for, but there is no firm commitment for those kilowatt hours.

Q Do I understand then that the Connecticut Power Company is able to deliver electric energy in exchange operations which it receives from the Hartford Electric Light Company, but which the Hartford Electric Light Company is not committed to furnish it? *A* That is correct.

Mr. Branch: May I have that question read?

Trial Examiner: Read the question for the benefit of counsel:

(Question read by Reporter.)

By Mr. Wahrenbrock: *Q* Do each of the members of the Exchange deliver for Exchange transactions energy which they are not bound or committed to deliver? *A* Yes. No company is bound to deliver any power at any time which it does not wish to deliver at that particular time to the Exchange.

Q Yet large quantities of energy are continuously exchanged by means of the Exchange? [*1150*] *A* Yes.

Q And the quantities of energy which are delivered, which are so delivered, are credited to the accounts of the members making the delivery? *A* That is correct.

Q And such credits are taken into account in the financial settlements which are made monthly among the members of the Exchange?

* * * * * * [*1152*]

A They are.

By Mr. Wahrenbrock: *Q* And is the same thing true where energy is received by members of the Exchange, that is, are quantities of energy received, even though there is no binding obligation on the part of the recipient to take the energy? *A* There is.

Q And are the amounts of energy—

Mr. Branch: It is understood, of course, my objection goes to this whole line of inquiry?

Trial Examiner: It is so understood and will be noted.

By Mr. Wahrenbrock: *Q* And are the amounts of energy which are so received debited to the member receiving them? *A* They are.

Q And are such debits taken into account in the monthly settlements among the members? *A* They are.

* * * * * * [*1155*]

By Mr. Wahrenbrock: *Q* Has the Hartford Electric Light Company been continuously connected with the Connecticut Power

Company South Meadow substation since August, 1935? *A* I know of no occasion when it hasn't been.

Q Have the feeders which have been previously referred to as 122, 123 and 124, continuously been closed—the circuits been closed? *A* At least one of them has been closed all the time. There might have been periods when more—or one might have been out of service for some particular reason.

* * * * * *

Q Mr. Mayott, did your answers which you gave to the credits and debits and the operation of the Exchange refer to the period since the disconnection in 1935, as you gave them?

Mr. Branch: May we have the question read?

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: It is my understanding that it did.

Trial Examiner: I want to ask one question, which [*1156*] possibly may have been brought out on Saturday, but I don't recall it. When was the Hartford-Agawam line constructed?

The Witness: It was constructed in 1924 and put into operation in February, 1925.

* * * * * *

ALLAN D. COLVIN,

a witness called on behalf of the Federal Power Commission, being first duly sworn, testified as follows:

Direct Examination by Mr. WAHRENBROCK.

Q What is your address, Mr. Colvin? [*1157*] *A* My residence is 8 Nathan Hale Street, New London, Connecticut. My business address is 31 Union Street, New London.

Q Do you hold a position with the Connecticut Power Company? *A* I do.

Q What is that position? *A* Executive vice-president.

Q How long have you been executive vice-president, of the Connecticut Power Company? *A* Since January, 1929.

Q How long have you been with the Connecticut Power Company? *A* Since January, 1929.

Q Are you an engineer by training? *A* I am a graduate of the Rensselaer Polytechnic Institute.

Q With what degree? *A* Civil engineer, 1906.

* * * * * * [*1164*]

Q How long was electric energy delivered by the Connecticut Power Company to the Connecticut Light and Power Company under the terms of this contract, of which Exhibit 25 for Identification is a copy, as extended by the two exchanges of letters which are appended as a part of that exhibit? *A* Letters dated November 7, 1938 from the Connecticut Light and Power Company, one of November 8, 1938 from the Connecticut Power Company, one of April 10, 1939, from the Connecticut Light and Power Company, one of April 11, 1939 to the Connecticut Light and Power Company, which extended the service for the East Hampton section until July 1, 1939. The service was actually terminated, according to the Connecticut Power Company's records, on June 30th, 1939.

Q And that service which was terminated on that date had been rendered under the terms of that contract as extended from the effective date of the execution of that contract, had it? *A* As far as I know.

Q Well, do you know? [*1165*] *A* As far as I know, I know of no detail in which the contract was not carried out.

Q Well, the Connecticut Power Company did sell energy at Pole 110 to the Connecticut Light and Power Company, from January 1, 1937 to June 30, 1939, did it? *A* January 1, 1937 to June 30, 1939.

Q And this contract, of which Exhibit 25 is a copy, together with the extensions therein, was the only contract which related to that sale? *A* Yes, sir.

Q And are you able to state whether the Connecticut Power Company had previously sold the Connecticut Light and Power Company electric energy at Pole 110? *A* Yes, sir.

Q It had previously sold them? *A* Yes, sir.

Q And do you recall for what period of time? *A* I do not.

Q Is your recollection sufficient to give us any idea at all of the period of time when it so sold? *A* I believe that it was prior to my connection with the Connecticut Power Company.

Q Which, as you said, was in 1929? *A* '29. To the Central Connecticut Power and Light Company, at that time.

[*1166*] *Q* And the Connecticut Light and Power Company succeeded to the facilities of the Central Company? *A* That is my understanding.

Q Will you describe the facilities by means of which the Connecticut Power Company supplied electric energy to the Connecticut Light and Power Company at Pole 110? *A* As of what date?

Q Under those two contracts, to which we have just referred? *A* Prior to the removal of the old Highway Bridge between Middletown and Portland, the cables were carried across on the bridge structure and went under the draw span in a submarine cable, and then came on and continued on the bridge structure.

* * * * * * [*1171*]

Q Mr. Colvin, I ask you if you can explain the time as of which the big sheet, which has been marked for identification as Exhibit No. 38, represented the facilities of the Connecticut Power Company, without respect to the insert which has been attached to it? *A* As of the close of the year, December 31, 1940, with the exception of an additional retail customer in the Town of Middletown.

Q That is, that the map includes a retail customer in the Town of Middletown, which was not true as of the date December 31, 1940? *A* That is true.

Q With the exception of the inclusion of that retail customer, the main map then is a substantially accurate representation of the facilities of the Connecticut Power Company, which it purports to show? *A* Except as far as work in progress in Torrington.

Q Yes. And that map is a map which you made available to

Commission staff representatives in the latter part of May? *A* Yes, sir.

Q And in order to show facilities at Torrington as of May 26, 1941, did you furnish the Commission representatives [*1172*] with a small insert for the map? *A* We did.

Q And is this small insert, which is stapled to the map, the insert which you furnished us? *A* I think it is part of the insert which we furnished you.

Q I think probably I can answer that, and I believe you will accept my statement, that it is the whole insert which you furnished us? *A* I will take your word for it.

Q It came to me by mail from you without any covering transmittal letter, and that is the insert I received. *A* All right, that is accepted.

Q Now, in order to clear up the relation of the lines, will you state which of the two lines which lead from Torrington substation, on the insert, is attached to CP-1 on the—or should be shown as connected to CP-1 on the main map? *A* For purposes of identification only, starting at the high voltage side of the 15,000 KVA transformer, and going to the transmission line in the shortest possible distance, as shown on this diagram, would connect you with the No. 1 CP circuit.

Q Which is the CP-1 line on the main diagram? *A* It is.

Q The lower line, or the upper line?

[*1173*] Mr. Branch: Of which diagram?

Mr. Wahrenbrock: The main diagram, the big sheet marked Exhibit No. 38 for Identification.

The Witness: On drawing 4031-F, under the title "Exhibit 38" under the point on the map which is lettered 66 KV steel tower transmission line, the No. 2 line is shown diagrammatically near the top of the diagram, and the No. 1 line is shown farther from the top of the diagram. In using the insert, which Mr. Wahrenbrock has described, it is necessary to disregard the section of the diagram above the word "Torrington", which occurs about in the center of the map, and a third of the way from the left-hand edge,

because it is shown on the diagram. It is also necessary to disregard on the flap attached to the diagram, two lines approximately an inch and a half long, occurring between the word "sub"—s-u-b—and corrected May 26, 1941, wherever they occur, to the right of the vertical lines going to the squares indicating two oil switches.

* * * * * * [*1175*]

Q With that correction, on which we have all labored, that explanation, on which we have all labored, Mr. Colvin, [*1176*] will you begin at the point at which the Connecticut Power Company receives electric energy from the 66 KV lines known as the C. P. 1 and C. P. 2 at Middletown, and trace the facilities and describe the facilities as you trace them on the diagram, by which it delivered electric energy to the Connecticut Light and Power Company at Pole 110 under the contracts which we were previously referring to?

Mr. Branch: As of what time?

Mr. Wahrenbrock: The date was fixed by his testimony about those contracts. I will be glad to get them out and go over all that again.

Mr. Branch: You mean during the entire period?

Mr. Wahrenbrock: Yes, with such explanations as may be necessary to account for the changes taking place during the period. I think that is a fair clarification of the question, Mr. Branch.

A Starting at the point where we take energy from the main transmission system of the Connecticut Power Company, the line—

Q (Interrupting) How is that point designated on this diagram? *A* May I finish?

Q I just wish to ask you if you can designate that point on the diagram. *A* Just a minute. The line to Middletown has been com- [*1177*] pletely rebuilt. It formerly went from what is known as "Switching Tower Point 12", located approximately 6 inches from the top of the map, to a 66,000 volt substation in Cromwell,

where it was changed to 13,800 volts and went to the substation in Middletown. That construction was entirely removed subsequent to the 1936 flood, and after the West Side Substation was placed in commission, the energy left the same point, Point 12 Switching Tower, previously described, and went on a steel tower transmission line to what is designated as the West Side Substation on Exhibit 38.

It then went from the West Side through underground cable across the river, in submarine cable, and went to a substation known as Wolcott Lane, which is shown on the diagram about six inches above the word "Division" appearing on the lower margin of the map.

Wolcott Lane Substation has also been entirely rebuilt within the last ten years, but in all cases the circuit from Wolcott Lane started as an aerial cable on poles, and later terminated in an open circuit on poles, to go to Pole 10 on Penfield Hill. The length of the aerial cable between Wolcott Lane Substation and Penfield Hill has varied during the time that is covered by the contract that has been discussed.

At Pole 110 the property of the Connecticut Power Company [*1178*] ceased and the energy was metered on a meter connected to suitable transformers, the meters being attached to Pole 110 and certain apparatus included in a little shanty which was beside that pole.

Q What was that "certain apparatus"? *A* I don't know, sir. The shanty was the property of the Connecticut Light and Power Company.

Q Who owned the meters? *A* The Connecticut Power Company.

Q Was there more than one meter? *A* No, sir; not more than one meter at one time, I cannot tell you that the meter was not changed during the period.

Q The Connecticut Power Company owned Pole 110 and the apparatus on the pole? *A* It owned Pole 110 and the meter. I

don't know that I can divide to an inch the ownership of wire between double arms.

Q And the Connecticut Light and Power Company owned the wire, the conductors from that pole leading toward East Hampton? *A* To wherever that circuit went.

Q Well, I am trying to identify the circuit. That was the circuit that led toward East Hampton, wasn't it? *A* I believe that that circuit did go to the so-called Leesville plant in East Hampton, but I have no direct information [*1179*] on that.

Q I show you Exhibit 26 and ask you if the line from the point marked on Exhibit 26 as Pole 110 to the substation identified as the West High Street Substation, is the line of the Connecticut Light and Power Company leading from Pole 110 to which you have just referred? *A* It is so indicated on this exhibit.

Q Did the Connecticut Power Company have any sources of electric energy available to it at Middletown, which it used to supply the Connecticut Light and Power Company at Pole 110, except the energy which it received from the C. P. 1 and C. P. 2 lines? *A* At what date?

Q During the period it delivered energy to the Connecticut Light and Power Company, under the contracts we have referred to. *A* There was formerly a steam plant located at Middletown. I am of the opinion that we served the Central Connecticut Power and Light Company at a time when that steam plant was in operation, but that date was prior to 1929, so not covered by your contracts. Now, your question is: Did we have any other source of energy in Middletown except the high voltage transmission system of the Connecticut Power Company, is it?

Q That is right. [*1180*] *A* None, except during an emergency period caused by the 1936 flood.

* * * * * * [*1183*]

Q Now, with the exception of two sources of supply, during a few days in 1936, the flood emergency, the only source of electric energy which the Connecticut Power Company sold to the Con-

necticut Light and Power Company at pole 110 was the energy it obtained from the CP-1 and CP-2 lines? *A* That is correct.

Q From August 26, 1935 to July 1, 1939? *A* June 30, 1939.

Q June 30, 1939; is that correct? *A* That is correct.

Q Thank you.

* * * * * * [*1189*]

C. L. CAMPBELL,

a witness called on behalf of the Federal Power Commission, being previously sworn, testified as follows:

Direct Examination by Mr. WAHRENBROCK.

Q Are you the Mr. C. L. Campbell who has previously testified in this proceeding? *A* I am.

Q While Mr. Roraback was still the president of the Connecticut Light and Power Company, and you were the vice-president, did you participate in handling Federal Power Act matters? *A* Yes, I took part in the discussions and conferences that went on in the matter.

Q Did you handle the correspondence with the Federal Power Commission? *A* Well, I handled such of it as took place—as occurred in respect to reports and information that they asked for, and matters of that kind.

[*1190*] *Q* Did you participate in the handling of the questions of making disconnections in order to avoid the incidence of the act at the time of the announcement? *A* Yes, I took part in the discussions that led to that decision.

* * * * * * [*1195*]

By Mr. Wahrenbrock: *Q* On that understanding, what would your answer be? *A* The answer would be that there was no doubt in my mind whatever that you did not have jurisdiction over us. I was as sure of that as I was that the sun rose this morning. I had, however, grave doubts as to whether we were required, under the law, to give that kind of information which you were asking for because that goes into that very broad general which I under-

stand, as to the extent to which Congress can by enactment invade the privacy of private citizens to obtain information which may be helpful to them in the passage of laws, which has never been, as I understand it, fully adjudicated.

Q Directing your attention to the succeeding statement which you make in that paragraph, was it your position that the State of Connecticut could forbid the Federal Power Commission to regulate a public utility in the State of Connecticut, using the words "public utility" in their ordinary connotation?

[*1196*] Mr. Branch: What was that question, please?

Trial Examiner: I think the question better be repeated, especially as to the last part. The counsel doesn't seem to follow it.

Mr. Wahrenbrock: I didn't understand the Examiner's remark.

Trial Examiner: I would like to have the question repeated. Mr. Reporter, will you read the question back?

(Question read by reporter.)

A If my recollection is right, there is a statute in Connecticut to that effect, and I have assumed that Connecticut laws would prevail in the State of Connecticut?

By Mr. Wahrenbrock: *Q* Then it was the position of your Company that the State of Connecticut could validly prevent the Federal Power Commission from regulating a public utility in the State of Connecticut? *A* In so far as the transactions within the State of Connecticut.

* * * * * * [*1212*]

Q Mr. Campbell, I would like to direct your attention to the period of time immediately following the enactment of the Public Utility Act of 1935 and ask you if you recall that Mr. Samuel Ferguson made several efforts to obtain rulings, made [*1213*] two principal efforts to obtain rulings from the Federal Power Commission, which would have enabled the restoration of the Connecticut Valley Exchange operations, without subjecting the companies, or some of the companies to a jurisdiction of the Federal Power Commission? *A* Were you stating a fact or asking me a question?

Q Asking you if you recall that Mr. Ferguson made those attempts.

Trial Examiner: Would you word that question slightly differently, to avoid a conclusion?

By Mr. Wahrenbrock: *Q* Do you recall whether Mr. Ferguson made attempts to obtain such rulings from the Federal Power Commission? *A* By Mr. Ferguson, I assume you mean Mr. Samuel Ferguson, President of the Hartford Electric Light Company? *Q* Yes. *A* Well, I wouldn't have any particular way of knowing what he did or did not do.

Q You had no knowledge? *A* No. I don't say that. He might have mentioned it to me, and if so I might not have paid much attention to it. He was running his company and I was running mine, to the extent that I was running it at that time.

Q Do you recall that he made efforts to obtain rulings from the Federal Power Commission? [*1214*] *A* You say that was shortly after the passage of this Act?

Q Yes. *A* That would be in August or September, along in there, of '35? I frankly do not remember.

Q That is true. And in October. *A* I don't remember anything about it. He may have done so and he may not have; he may have told me that he did, and he may not have.

Q Do you have any recollection that Mr. Ferguson sought to obtain an interpretative opinion from the Federal Power Commission? *A* I can't recall anything. Certainly he wasn't doing it in conjunction with us or on our behalf.

Q Do you have any recollection that Mr. Ferguson sought to obtain from the Federal Power Commission an arrangement which was colloquially referred to as a "trial marriage"? *A* I don't recall anything of that kind, no.

Q Do you have any recollection that earlier; that is, in September of 1935, Mr. Ferguson proposed to obtain an emergency order from the Commission? *A* In September, 1935?

Q Yes. *A* No. I am sorry I don't recall anything about it. There was a period later on, much later on, that that question

arose. [*1215*] I am not saying he didn't , you understand, but I have no recollection of it.

* * * * * *

Q Mr. Campbell, I direct your attention to Mr. Ferguson's letter of October 25, in Exhibit 44 for Identification, and the memorandum attached thereto, and ask you if, by referring [*1216*] thereto and refreshing your recollection you recall the subject matter to which that letter refers?

Mr. Branch: May I have the question read?

Trial Examiner: The Reporter will read the question for the benefit of respondent's counsel.

(The question is read by the reporter.)

A Well, frankly, to the best of my recollection I never saw or heard of the matter before. I am quite sure it was not done for anything in which we had any part.

[*1217*] By Mr. Wahrenbrock: *Q* I direct your attention to the letter of September 27, 1935, in Exhibit 44 for Identification, and ask you if, by referring to that letter and the attached memorandum, your recollection is refreshed concerning the subject matter of that letter and memorandum.

Mr. Branch: What is the date of that letter?

Mr. Wahrenbrock: September 27, 1935.

The Witness: My answer to that is the same. I never heard of it or saw it, so far as I recall.

Q I now direct your attention to September 18th—I beg your pardon—September 16th, 1935, which is a part of Exhibit No. 44 for Identification, and ask you whether, by looking at that letter, you are able to refresh your recollection and recall the subject matter to which that letter refers. *A* I seem to remember this, that Mr. Ferguson, who happens to lunch at the same club that I do quite frequently, mentioned to me at the luncheon table that he had received a letter, I think he said, asking for some information, a letter from the Federal Power Commission asking for some information. As I recall it now—I am relating, or attempt-

ing to recall a conversation which took place almost six years ago —that he had wired to the Commission to know whether the information they were asking for was requested by—I think this was it—requested by the chairman personally, or [*1218*] officially by the Commission, and he had received a reply—because if it was the latter he would have to first obtain permission of the Public Utility Commission of Connecticut to reply—and that he had subsequently received a reply that it was official, insisting that the information be furnished, and that he had thereupon taken it up with the Public Utility Commission, and had received their permission to furnish, and had furnished it. He was narrating it just as—well, as a kind of a news item in the industry. I had nothing to do with it, and it didn't affect me in any way.

Q And was your knowledge of the subject matter of this letter of September 16th and any correspondence or communications which may have preceded it, limited to what you have just said?

Mr. Branch: Was the correspondence limited?

Trial Examiner: No. He said was his knowledge limited.

Mr. Wahrenbrock: I suggest that the question be read.

Trial Examiner: The question had better be read for Mr. Branch's benefit.

(Whereupon the last question as above recorded, was read by the reporter.)

Trial Examiner: Do you desire the question and answer preceding that read?

Mr. Branch: No. Thank you.

The Witness: Well, I have no knowledge of the matter at [*1219*] all, and I am merely assuming that the conversation which had been related, related to this. I don't know that it did.

Q You had no further knowledge than what you have just testified to? *A* Yes, and I don't know, I can't be sure that that applied to this particular matter.

Mr. Wahrenbrock: I believe Mr. Barney has furnished you with a copy of this (handing document to Mr. Branch).

By Mr. Wahrenbrock: *Q* Mr. Campbell, I show you a copy of

a letter bearing the signature of S. Ferguson, Chairman of the Board, on the letterhead of the Hartford Electric Light Company —that is, I assume the original letterhead was that of the Hartford Electric Light Company because on the top of the carbon copy there is typed, "Hartford Electric Light Company, Hartford, Connecticut"—on the date of September 17, 1935, addressed to you, that is, to Mr. C. L. Campbell, vice-president of the Connecticut Light and Power Company, that being a copy furnished me by Mr. Barney upon behalf of the Hartford Electric Light Company in response to the subpoena recently served upon that company, and ask you whether you received that letter? *A* Well, that I can't tell. I don't recall receiving it.

Q Can you ascertain from your files whether you received that letter? *A* Yes, it probably can be ascertained. The fact that [*1220*] it was sent, I expect it must have come to me, but it wouldn't be a matter that I would—it didn't affect, or concern us, or relate to our company, so I—I receive quantities of information like that which I can't be expected, after six years, to recall having received.

Mr. Wahrenbrock: I ask that the letter be marked for identification as Exhibit No. 45. I will have copies prepared and will be prepared to submit the copies by tomorrow, Mr. Examiner.

Trial Examiner: The letter will be marked as Exhibit No. 45 for Identification.

(The document referred to was marked as Exhibit No. 45 for Identification.)

* * * * * * [*1229*]

Mr. Wahrenbrock: For the purpose of refreshing or attempting to refresh Mr. Campbell's recollection, I would like respondent's counsel to make available for showing Mr. Campbell, a letter to Mr. Roraback dated November 29th.

Mr. Branch: From whom?

Mr. Wahrenbrock: From Mr. W. E., I believe are the initials, Thoms.

Mr. Branch: We have the original here, sir. That introduces this question of privilege, and—

Mr. Wahrenbrock: Well, Mr. Examiner, that letter has [*1230*] been shown to me without objection by respondent's counsel. Whatever privilege there may have been with respect to that letter had been waived by showing it to me without objection.

Mr. Branch: Oh, sir, I think you are quite mistaken about that.

Mr. Wahrenbrock: Well, if you think I am mistaken, I will tell some of the things in the letter, if you would like to have me do so.

Mr. Branch: No, I am quite certain that you got a copy of that letter from somebody else, and so you do know about it.

Mr. Wahrenbrock: Mr. Branch, I received the letter, a copy of it, last night, in the office of The Connecticut Light and Power Company, and it is in the file which was shown to me last night and it is in the list of documents which you submitted to me as the list of documents which you made available for my inspection.

Mr. Branch: Well, may I confer with my associates?

Mr. Wahrenbrock: I think you should.

Mr. Branch: You say you have a copy that we gave you?

Mr. Wahrenbrock: No, sir. You have not given me a copy of that. You made it available for my inspection.

Mr. Examiner, inasmuch as this has been raised, and appears to question the credibility of the statements I have made, I desire to clear myself, and I am going—

Mr. Branch: May I say this in answer—

[*1231*] Trial Examiner: One of you will speak at a time, please.

Mr. Branch: May I make a statement, because I am not reflecting on your credibility at all.

Mr. Wahrenbrock: As the record stands it does seriously—

Mr. Branch: I don't wish to, and I wish to make it clear. I personally have not furnished that to Mr. Wahrenbrock; if it was furnished to him it was done without my knowledge. If he says that it was, and on reflection I find that to be so, I want to be very

clear I am not in any way reflecting on your credibility. I am looking the matter up, but I certainly didn't want to wish to say you were not telling the truth.

Mr. Wahrenbrock: I want to make this clear. You have acted through other persons, but I have consulted with you, and I have looked at only those documents which other persons under your direction made available to me. Isn't that true?

Mr. Branch: I will say this. I am not attempting to evade any responsibility. There were some 600 documents, I think, given to Mr. Wahrenbrock. I did not examine those. I gave certain instructions to my associates, and I think it is quite possible, in the course of this great correspondence, that there may have been some oversight there. I want to make it perfectly clear that I am in no way stating that Mr. Wahrenbrock is saying anything that he believes to be untrue. I am merely saying I had no knowledge of the fact, if it is so, and I did not understand it to be so.

[*1232*] Mr. Wahrenbrock: I think you should go further in your statement and not only say that I am not stating anything which I believe to be untrue, but that I am not saying anything that is untrue.

Mr. Branch: I don't know what—

Mr. Wahrenbrock: I want to make it clear. I hand the Examiner a copy of the list which Mr. Branch himself delivered to me by letter—he didn't personally deliver the letter, but it was covered by his letter of transmittal last Sunday—a list of documents made available to me, and I call the Examiner's attention to the last item in the fourth paragraph on the first page of that list, and in order that the record of the Commission may show what I am trying—what I am referring to, I ask that that list be part of the record in this case, with the letter of transmittal from Mr. Branch, which I will hand you.

Mr. Branch: May I make this statement, sir. I am now informed for the first time that not the original of this letter, which I think never was displayed to Mr. Wahrenbrock, but apparently a copy of it was in some file which I had not seen, and I under-

stand that it does appear that a carbon copy of that letter was among the papers which Mr. Wahrenbrock examined. I was not aware of that fact until this morning. I have the original and didn't realize there was a copy that was given to them.

* * * * * * [1237]

Mr. Wahrenbrock: Mr. Examiner, I ask that the long list be marked Exhibit 46, Mr. Branch's letter of transmittal of the long list be marked Exhibit 46-A; the short supplementary list be marked Exhibit 46-B and the letter of transmittal dated July 15th, of the short supplementary list be marked Exhibit 46-C, all of these for Identification only.

Trial Examiner: The reporter will so mark them.

(The documents referred to are marked as Exhibits numbers 46, 46-A, 46-B and 46-C, respectively, for Identification.)

Mr. Wahrenbrock: May the copy of the letter to which I have referred be produced for the witness's reference?

Mr. Branch: What did you say?

Trial Examiner: By that you refer to the letter to Mr. W. E. Thoms. I am not sure that I know which is which on that.

Mr. Wahrenbrock: It is the letter from Mr. Thoms to Mr. Roraback dated November 29th, 1935.

Mr. Branch: I have the original and I object to producing it on the ground that it is a privileged communication between attorney and client.

Trial Examiner: In that case, Thoms being counsel for the Connecticut Light and Power Company, you mean?

Mr. Branch: Yes, sir.

Trial Examiner: It would seem to me that the question of what is to be submitted in response to the subpoena would be a question for determination. Do I understand that you now [1238] take the position that you decline to produce this document on the ground that it is a privileged communication?

Mr. Branch: I don't want to say "decline", sir. I am raising that objection, but will obey your ruling, whatever it may be.

* * * * * * [*1240*]

Trial Examiner: As I understand this list was prepared by other members of the staff of counsel, under your direction, was it not?

Mr. Branch: It was prepared by the stenographic force of the Connecticut Light and Power Company on Sunday, sir, at the request of Mr. Wahrenbrock.

[*1241*] Trial Examiner: But they were acting under the supervision of the members of the legal staff, were they not?

Mr. Branch: I told them to prepare a list of everything Mr. Wahrenbrock had seen, and I don't want to be understood at all as questioning the fact that this document appears in the list and that he saw it. I want to make that perfectly clear. That is, a copy of the document.

Mr. Wahrenbrock: Mr. Examiner, may that statement be augmented by this.

The documents which I saw were documents made available to me in the offices of the Connecticut Light and Power Company by officers or employees of that company acting under the direction of its counsel.

Mr. Branch: Of course I assumed that Mr. Wahrenbrock understood that everything that he has done in going there, and so forth, has been at times that we have arranged, and with our permission.

Trial Examiner: It would seem clear to me that it is the duty of respondent's counsel to determine what documents would properly be both within the scope of the subpoena and otherwise, in their opinion, proper subjects of the subpoena, and being used in evidence, and if by reason of convenience, they have chosen to hurry this up and in doing it inadvertently something may have escaped them, I don't think that Commission's counsel can in any way be held responsible for that. Since [*1242*] there seems to be a clear duty on the part of the respondent's counsel to check such matters before releasing them, I fear it will be necessary to rule as to this particular document that by the submission of the

list and copy, counsel has waived any right to claim privilege. Passing for the present to the question of whether the privilege may be claimed as to this particular document, the Trial Examiner rules that privilege has been waived.

Mr. Branch: May my exception be noted, sir?

Trial Examiner: Your exception will be noted. You may proceed.

Mr. Wahrenbrock: Will the Examiner direct that the document in question, the carbon of the document in question, be produced?

Trial Examiner: May that be done? May the carbon be produced for the inspection of the witness?

Mr. Branch: The carbon?

Trial Examiner: The carbon copy of this letter which is referred to as having been shown to Commission's counsel.

Mr. Branch: Subject to my objection, and may I state here that I object to any use of it at all without the necessity of my rising each time the thing is mentioned?

Trial Examiner: It is so understood.

(The document was produced and handed to Commission's counsel.)

* * * * * * [1258]

Q Mr. Campbell, in this answer which you gave on page 913 of the transcript, I believe you were referring to a copy of Mr. Ferguson's letter to the Federal Power Commission, dated September 16, 1935, which is attached to and forms the last part of Exhibit No. 44 for Identification, and in that answer as reported by the transcript you said:

> "*A* Well, I assume that this is a letter written by Mr. Ferguson to the Commission, in respect to his own company and with respect to his own business. It may be that after he had sent it, either promptly or at some subsequent date, he may have sent a copy of it to our office. We may or may not have read it. We get a great deal of information in our office about various matters, the activities of other companies,

some of which we are not interested in and some of which we are not. I do not recall ever having seen it before, and yet I don't want to be understood by that to say that it did not come, perhaps, even in a letter addressed to me, but even under those circumstances, I would not have felt impelled to have read it, because it presumably dealt with [*1259*] matters concerning the Hartford Electric Light Company, not with our company. We will do our own corresponding."

That completes my reading of your answer. Now, would you say the same thing was true with respect to the memorandum and letter of transmittal which is Exhibit No. 47 for Identification?

* * * * * * [*1260*]

Trial Examiner: Answer it and make your explanation.

The Witness: Well, the answer is substantially the same, excepting with this difference. In one case I was referring—I was answering a question relating to a letter from an officer of another public utility company to the Federal Power Commission. I have nothing to do with—I have nothing to do with such letters being written, and I had no control over them. I was saying that if a copy of it had been sent to me, I might or might not have paid any attention to it. This letter of November 19th is a letter addressed by the same officer of the other public utility to our president, setting forth what he thought would be a sound and proper way to carry on some business in which we were jointly interested, and he asked me—he states, "We hope that you will see your way to take the same position."

Now, that is entirely a different kind of a letter. That would call for some kind of a reply to it, because it was addressed to us. With that difference, the answer perhaps is about the same. We would have paid to it such attention as we felt our interest called for, and, as I remember it, I think it was suggested that a conference might be had.

* * * * * * [*1262*]

Q Did this subject matter involve the question of the continu-

ance of interchange of electric energy between your company and the other members of the Exchange at New Britain? *A* Yes.

Q And the continuance of that exchange was regarded by your company as dependent upon the resolution of the questions raised by this memorandum, was it not? *A* No. It was dependent upon the Connecticut Power and the Hartford Electric Light Company severing their connections with the out-of-state companies.

Q And this memorandum proposed a basis of understanding upon which it was expected that an agreement might be reached between your Company and the Hartford Company for continued [*1263*] interchange of energy? *A* Well, of course, I don't know what was in Mr. Ferguson's mind when he wrote the letter, other than what he wrote. It appears on its face to be a suggestion from Mr. Ferguson that we should reconsider the previous position that we had taken in the matter. These memoranda were apparently his views, his ideas of what, as he says, would be a sound position to take. I assume that was the purpose of it. I of course do not know. He doesn't say so.

Q Did the Connecticut Light and Power Company at any time point out to Mr. Ferguson any error of fact as stated by him in this memorandum, Exhibit 47 for Identification? *A* Well, we never had the memorandum. Oh, 47? I beg your pardon. Yes. You mean the memoranda attached to Mr. Roraback's letter?

Q Attached to Mr. Ferguson's letter to Mr. Roraback. *A* Not so far as I know, but we wouldn't necessarily have felt under any particular obligation to do so. He was setting up a proposition and a picture which we were not much interested in, and we were going through what I think probably could be described as polite motions to turn him down.

Q Your Company had already determined what its position would be? *A* Yes.

Q And what was that position? [*1264*] *A* That we would not continue our connection with the Connecticut Valley Exchange, I think it was called, so long as there were connections between that system and out-of-state companies.

Q Why not? *A* Because we felt that there were two reasons: First, that the Federal Power Commission might take the view that those facilities were used in the transmission of interstate power, and that the Connecticut Light and Power Company, as a member of that exchange, which was not an incorporated body—it was just an association—might take the view that the Connecticut Light and Power Company as a member of that association, was operating those facilities, and if they were right, if they should be right in their possible contention that interstate power was transmitted over those facilities, then the operation of those facilities by us as a member of that Exchange, might bring us within the jurisdiction of the Federal Power Commission.

The other reason was that pumping power into that Exchange might be held that some of the power which we generated and pumped into that Exchange, found its way through these connections that I speak of, into other states, which again might be construed to subject us to the jurisdiction of the Federal Power Commission. So, for the two reasons, we withdrew.

Q I call your attention to the statement which appears [*1265*] on the second page of the memorandum attached to Mr. Ferguson's letter of the 19th of November, Exhibit 47 for Identification, under the heading: "Points B and B-1, substations of the Connecticut Light and Power Company."

Mr. Branch: Just excuse me a moment. We are in a little disagreement as to Mr. Campbell's answer to the last question. We would like to have it read.

Trial Examiner: The reporter will read back the answer to the last question.

(Answer is read by the reporter.)

Mr. Wahrenbrock: Will the reporter read as much of the present question as I had gotten off my chest?

Trial Examiner: The reporter will read the question for the benefit of Commission's counsel.

(Pending question read by the reporter.)

By Mr. Wahrenbrock: *Q* Mr. Campbell, by referring to the

map, which is a part of Exhibit 47 for Identification, will you state for the record what the points B and B-1, or B-prime, whichever it may be, referred to in the memorandum, are? *A* Where are they located, do you mean?

Q Yes. *A* They are down in the lower right hand corner, just below the word "Montville", and just to the right of the words "New London".

[*1266*] *Q* Is the point B, the Groton-Long Point High Voltage Substation? *A* Is the point B, you say?

Q Yes. *A* Well, I don't know what they call it. It is the first point of delivery to Groton by us.

Q Is the Point B prime the so-called Trails Corner Substation, in the Borough of Groton? *A* Well, I don't know whether it is located in the Borough of Groton or not.

Q Those are the substantial locations of the points indicated by those two letters, are they not? *A* Yes.

Q On that understanding, is the statement which follows true:

> "These are points of delivery for power sold by the Connecticut Light and Power Company to the Electric Department of the Town of Groton."

Was that statement true, as of the time of this memorandum? *A* Well, it is difficult for me to answer that with this lapse of time, because we have a great many substations, and just where the point of delivery was to Groton, at that particular time, I hesitate about answering, because I can't recall it very clearly.

[*1267*] *Q* Your company never denied the accuracy of that statement as made there? *A* This statement made by Mr. Ferguson?

Q Yes. *A* It has not been our practice to deny the accuracy of statements made by other officers of other utilities with which we have nothing to do.

Q In the course of the negotiations of this sort—in the course of this negotiation with the other company, did you or did you not ever deny the accuracy of that statement? *A* The only nego-

tiations which might have followed from this letter would have referred to the restoration of the interconnection, or an exchange of power with the Connecticut Valley Power Exchange. This particular situation had nothing whatever to do with it, therefore, it wouldn't be necessary to deny or affirm it, or make any mention of it whatever. It had no bearing on it whatever.

Q Now, will you answer my question? *A* Well, therefore, I should say we did not deny it, neither did we assent to it.

Q You did not deny it? *A* Neither did we assent to it.

Q Is the next statement true as of the date of this memorandum? That statement reads: "This power is eventually sold by Groton to its customers within the State. One of [*1268*] these customers, Fishers Island Farms, transmits the major portion, but not all of the power so purchased, to Fishers Island, New York."

* * * * * *

A The first sentence is correct as stated. The [*1269*] second sentence is correct, excepting with this qualification. I don't know the corporate name or the correct name of the particular customer to which he has referred to as "Fishers Island Farms". Secondly, I don't know what proportion of the power so purchased by Groton is sold by Groton to that particular customer named as Fishers Island Farms. I don't carry it in mind. So whether it is a major portion or a small portion, I am unable to say.

Q I think the record will show the exact ratios. *A* I have no doubt of it. I just don't have it in my mind.

Q And I think also the record will show the accurate name of the company on Fishers Island. I call your attention to the paragraph at the bottom of the same page, being the paragraph numbered 2, under Point C—substation of the Connecticut Light and Power Company, with the introductory clause reading, "This substation is used for two purposes: First,"—and I will skip the first one. "And 2, to receive and distribute within the State, power purchased from the Connecticut Power Company, which power may according to the business necessities of the Connecticut

Power Company, have been generated either in its own plant, or had been purchased in whole or in part from other companies, within or without the State." And I direct your attention to the map which accompanies the memorandum, or a part of the [*1270*] memorandum, and point out that the point C referred to is New Britain. Now, with that understanding, was that statement accurate as of the date of the memorandum? *A* No.

Q Was that statement accurate as of the time immediately before the disconnections which occurred on or about the 25th of August, 1935? *A* Well, I should say no. But I probably don't know.

Q Well, will you explain? *A* Yes. The substation referred to is used in addition to the purposes set forth under paragraph 1, to receive the power purchased from the Connecticut Power Company, which power was to be delivered to us by the Connecticut Power Company from facilities of its own, or, backed up by a contract it had for firm power with the Hartford Electric Light Company, which—so that between them we were satisfied that they had the capacity with which to meet our needs, and so far as we know, that is where our knowledge stopped.

Q You then state that so far as was known by the officials or employees or representatives of your company, that you had no knowledge of where the power actually received by you at New Britain came from? *A* Yes.

Q It may have come from Canada, it may have come from [*1271*] New York City, it may have come from any place, so far as you know? *A* No, I don't think I would like to embrace Canada in it, because of our general knowledge as far as I know, there were no physical connections that were even possible for any energy to come through.

Q Then you do have some knowledge of physical connections outside of your own system? *A* Yes.

Q What physical connections were there by which this power might have come to your system? *A* From Canada?

Q From any place else than from the Hartford Electric Light Company? *A* At what date?

Q As of the time immediately prior to the disconnection which took place about August 25, 1935.

* * * * * * [*1272*]

The Witness: There are so many interruptions—I am sorry, but is that question as to whether I knew of any connections with that system—that the Exchange had with out of State systems?

By Mr. Wahrenbrock: *Q* It asks for your knowledge of connections by which the energy which you received in New Britain could have been supplied.

Mr. Branch: I don't think he said there was anything of [*1273*] that kind.

Trial Examiner: I think he said that he had a knowledge of physical connections, and the letter and memorandum raises the question as to the existence of such sources of energy. The witness may answer the question.

The Witness: I knew that prior to August 26, 1935. that is the date, that the Connecticut Valley Exchange had lines which connected with systems outside of the State. I don't know, and I didn't know then, that any of that power that came from outside of the State over those systems was ever received at this particular substation.

Q Didn't you know about the operations of the Connecticut Valley Power Exchange? *A* Yes.

Q Didn't you know that the way the Connecticut Valley Power Exchange could realize savings was by using low incremental cost energy wherever it could be derived, and that included using it from out of the State at times? *A* No, I didn't know that, whether it was out of the State or where.

Q Didn't you know that one of the sources of savings by the Connecticut Valley Exchange operations was using the low cost, or zero cost energy from the hydro plants up in Massachusetts?

Q Yes, but I didn't know that any of that energy went [*1274*] to New Britain.

Trial Examiner: Is your answer yes or no to that?

The Witness: I answered yes.

By Mr. Wahrenbrock: *Q* If you didn't know whether any of that energy went to New Britain, why did you cut your New Britain interconnection? *A* I just stated the reason we cut the New Britain interconnection was because we might have been deemed or treated as one of the operators of that system over which some power from outside of the State was transmitted to points unknown, as far as I am concerned, and over which possibly power which was generated by our own company and delivered to that system might have gone into other States. Those were the reasons we disconnected.

Q And the other reason—you gave two—the other one was that some of the out of State energy might come down under your own system? *A* No, I don't think I said that.

Mr. Branch: No, he didn't say that.

Trial Examiner: I don't think that was the statement. We will probably have to go back to the transcript to get it determined.

By Mr. Wahrenbrock: *Q* If your reason had been as you just stated, and it [*1275*] did not include the one I thought you stated, wouldn't it have been sufficient if you had just stopped being a member of the Exchange?

Mr. Branch: I object to that question.

The Witness: We didn't deem it so, so we took the step that seemed right.

By Mr. Wahrenbrock: *Q* You physically disconnected in order to prevent any of that energy from coming on your system? *A* No, sir. We physically disconnected for the reason I stated—I think this is the third time—that we did not wish to be considered or possibly construed to be operating a system over which interstate power might have been transmitted. That was the prime reason.

[*1276*] *Q* In that case, why didn't you cut the Groton connection? *A* Because we did not consider at that time that that was a facility of the character that was transmitting out-of-state energy.

Q You knew that you were, to use the expression which you have previously used, pumping energy that went into New York State, didn't you? *A* We knew that we delivered energy to a Municipality, and that some corporation, whose name I don't exactly recall, something to do with Fishers Island, came to that Borough, or the shores of Connecticut and took it away.

Q So that you knew that you were pumping energy out of the State? *A* No, I wouldn't say that; we weren't doing it.

Q How would you distinguish that from the situation where you delivered electric energy to the Connecticut Power Company at New Britain and it subsequently took it out of the State, so far as the electric energy is concerned? *A* As I have said, there were three reasons why we disconnected from the Exchange. Certainly the first reason didn't apply in the Groton situation.

Q What was that first reason? *A* The first reason was the owning of operating facilities used in interstate commerce; that is, used in the transmission [*1277*] of interstate power. That is not, in our judgment.

Q Why doesn't that apply to Groton? *A* Well, we didn't consider we transmitted it at that time.

Q All right. I would like to ask you to state what factors upon which you differentiated, in saying that when you delivered electric energy at New Britain, which electric energy subsequently went out of the State, you might properly be held to be transmitting electric energy in interstate commerce and when you delivered electric energy at the Borough of Groton, which was subsequently transmitted out of the State, you were not transmitting electric energy in interstate commerce? What facts differentiated those two situations, in your mind, in 1935? *A* The transformation that took place of the power at the delivery point to Groton, for one thing; secondly, this action taken in respect to the Exchange was taken practically at the time the Act was passed, just prior to it. The Act was new; we were studying it all the time, and endeavoring to follow the rulings and interpretations that were being placed upon the Act by either formal or informal deci-

sions or actions of the Federal Power Commission, and as we found situations which had looked to us, under the law, as we interpreted it, which came, by subsequent rulings or decisions of the Commission, into what I would refer to as a danger zone; that is, where the [*1278*] Commission might apparently hold that to be a transmission in interstate commerce, we would endeavor to correct that situation, so as to conform to what has been the established policy of the Company for many years, to remain purely in intrastate.

Q And that policy has continued down to the present day? *A* Yes.

Q Did that enter into your consideration in terminating your purchases from the Connecticut Power Company at Pole 110, to supply East Hampton? *A* It might have. There might have been other considerations also, common to the service, or something of that kind.

Q It was one of the considerations? *A* I have no doubt it was.

Q I believe that in discussing the Groton situation just now, you said that you did not consider in 1935 that you were transmitting electric energy in interstate commerce. When did you subsequently take a different view? *A* No, we didn't take a different view, excepting in so far as we were influenced to take a different view by what appeared to be the attitude, I mean, the rulings, or trend of the Federal Power Commission, in their interpretation of the Act as matters came before it, not affecting us, but affecting others, which seemed to indicate that they so construed it. So we felt that [*1279*] we might remove the point of argument.

Q And that was the reason for asking the Borough of Groton to discontinue serving Fishers Island? *A* I don't know that we ever asked the Borough of Groton to discontinue serving Fishers Island. We told the Borough of Groton that we would not enter into a contract for the supply of power to the Borough until they would be able to assure us that they would confine their sales of power

to the territory which they had a right under the laws of Connecticut to supply.

Q And that was in accord with the policy you have just stated? *A* Yes.

* * * * * * [*1279*]

Q I wish to ask you if the Connecticut Light and Power Company made any suggestion to Mr. Ferguson or Mr. Ferguson's associates with respect to the omission of the part of this memorandum attached to Mr. Ferguson's letter of November 19th which follows under the heading "Points B and B-1"? *A* My recollection is that following the receipt of this letter it was suggested that a conference be held. I don't believe any such conference was held. Whether it was our fault that it wasn't held or Mr. Ferguson's, or just what, I don't know, but anyway I don't believe it was ever held. Undoubtedly if a conference had been held, perhaps these inaccuracies in this statement would have been discussed and [*1280*] pointed out, but they were not pointed out prior to any such conference or formally in any way. I don't believe they were discussed with Mr. Ferguson.

Q None of what you have termed inaccuracies were called to Mr. Ferguson's attention? *A* Not as I recall it, because there was no particular reason for doing so. He can have as erroneous an idea as he wishes to about our system and it is not a matter of interest to me.

* * * * * *

Q Did you know at that time, or did any representatives of the Connecticut Light and Power Company know at that time, that Mr. Ferguson had submitted substantially the same memorandum to the Federal Power Commission? *A* I don't know, and I don't believe any of our officers or employees did know.

* * * * * * [*1282*]

Q You have no knowledge whatever of the circumstances under which the latter letter, which is Exhibit 18, was induced to be

written? *A* Well, I didn't know it was induced to be written. I know that the matter, this whole question involved in these two letters, was discussed between Mr. Tiffany and Mr. A. V. S. [1283] Lindsley, one of our vice presidents. What transpired between them, I don't know.

Q Weren't the results of those conferences and relations reported to you? *A* Oh, yes, those letters—I didn't mean to suggest that I wasn't familiar with those letters, but I don't know what transpired between Mr. Lindsley, representing our company, and Mr. Tiffany, of the Groton Company.

Q Wasn't it reported to you that the second letter had been written after the first letter had been shown to the representatives of your company, upon the suggestion of the representatives of your company? *A* All I can say as to that is that I seem to recall that the first letter was shown to me, and we felt it was not correct, and I asked Mr. Lindsley to go and see Mr. Tiffany and discuss it with him. What took place in the discussion, I don't know. I was subsequently shown the letter of the next day, which seemed to be correct.

Q When you asked Mr. Lindsley to discuss the first letter with Mr. Tiffany, how was he to discuss it? *A* Well, the first letter appeared to be inaccurate, as we understood it, as we understood the circumstances in certain respects, and the purpose of Mr. Lindsley to go and see Mr. Tiffany was to discuss those inaccuracies.

* * * * * * [1292]

Q Was there any attempt prior to 1939 to have the Borough of Groton discontinue selling to the company that served Fishers Island Farms? *A* I don't think so, no. No, not so far as I recall.

* * * * * * [1293]

By Mr. Wahrenbrock: *Q* I show you copies of a letter from Mr. Roraback to Mr. Ferguson, dated November 22nd, 1935, and of a carbon copy of a letter from Mr. Ferguson to Mr. Roraback,

dated November 23, 1935, which has been furnished me by Mr. Barney in response to the subpoena directed to the Hartford and Connecticut companies and Mr. Ferguson, and ask you whether you have seen those letters, or copies of them, before.

(Letters handed to the witness.)

A Just recently, when they were produced out of the files as a result of, I believe, your inquiry for them.

Q Yes. And from that inspection are you able to identify those as the letters that were sent and received? *A* Yes, I should say that those are copies of the letter, and I might add it confirms my recollection that it had been [*1294*] suggested that a conference —I don't recall at the time whether the suggestion for a conference was made orally or whether it was made by letter. Evidently it was by letter.

Mr. Wahrenbrock: If I can get one or two more statements about this, I don't believe it will be necessary to put them in the record.

By Mr. Wahrenbrock: *Q* Do they show both Mr. Roraback and Mr. Ferguson agreeing that a conference should be held with respect to the matters raised originally by Mr. Ferguson's letter of November 19th, 1935? *A* Yes, they do.

Mr. Wahrenbrock: Mr. Examiner, I offer Exhibit 48 for identification in evidence at this time.

Mr. Branch: Which is that? I object on the ground that it is immaterial, as well as on the other grounds which I have specified, in connection with mention of this letter, but I don't see what possible bearing it has. This witness said he thinks he never saw the letter. has no recollection of having seen it until a day or two ago.

Trial Examiner: Do I understand that there is any question as to the signature of Mr. Thoms?

Mr. Branch: I have no doubt that that is his signature, sir.

Trial Examiner: Exhibit Number 48 will be admitted. Note [*1295*] an exception for the respondent.

(Exhibit Number 48 for Identification was marked Exhibit Number 48 in Evidence.)

By Mr. Wahrenbrock: *Q* Mr. Campbell, I show you a letter, purporting to be signed by V. E. Bird, President, on the letterhead of the Hartford Electric Light Company, dated September 26th, 1935, and addressed to Mr. Irvin W. Day, Vice President of the Connecticut Light and Power Company, which is the letter which has just been handed to me by Respondent's Counsel, and ask you if that letter was received by the addressee. *A* Well, of course, I can't tell. I have no way of knowing. I happen to be familiar with Mr. Bird's signature, and I know that is it; at least, I recognize his signature, but as to whether that is Mr. Day's, who was formerly a vice president of our company, I can't tell you from this.

Q The letter was taken from the files of the respondent. *A* Then it was received by him.

Mr. Wahrenbrock: Mr. Examiner, counsel for the respondent have offered to make copies available—at this point I would like to reserve an exhibit number, and have the copies when available tomorrow morning, marked for identification. I will then offer them in evidence.

Mr. Branch: I want to be accommodating, but I didn't promise we would have them for tomorrow morning. I think you [*1296*] hadn't requested the copies of this, so we have had no opportunity. We will do it at a reasonably convenient time.

Mr. Wahrenbrock: I accept the modification. I should not have stated "tomorrow morning". When you reasonably can have them—is that agreeable to the Examiner?

Trial Examiner: You desire, in order to keep this with a similar matter, to reserve an exhibit number?

Mr. Wahrenbrock: Yes. That number would be 49.

Trial Examiner: All right. It will be understood that Number 49 in the Exhibits for Identification will be reserved for this exhibit, when copies are prepared.

(Exhibit Number 49 is reserved for the document above referred to.) (For Identification.)

Mr. Wahrenbrock: Can respondent's counsel provide copies of the letter of November 26, 1935 from A. I. Campbell, Special Engineer, to W. E. Thoms?

Mr. Branch: Did you request us to make a copy of that?

Mr. Wahrenbrock: Yes. It is the last item on the second page of your list, Exhibit 46 for Identification.

The Witness: It ought to be A. J. The second initial happens to be "J".

Mr. Wahrenbrock: That is my mistake. It is Alex J. Campbell on the list.

Mr. Branch: Am I correct, Mr. Wahrenbrock, in assuming that the only place that you have seen this letter was when you [*1297*] looked at our papers at our office?

Mr. Wahrenbrock: I know that I have seen it twice, when looking at the papers you made available to me in your office, it being part of those papers. I cannot say definitely, in the large number of papers I have looked over, because I have looked over not only the 660 you have made available, but all that Mr. Tiffany made available, and all that Mr. Barney made available, and I cannot make a statement as to whether I have seen a copy of it elsewhere or not.

Mr. Branch: I have, I might say, a copy of the letters, and have made photostats at the request of Mr. Wahrenbrock, it being apparent that he had seen this letter when he was making this inspection which, of course, I did not assume, under the arrangement we made, was in any way to affect our legal rights as to anything. I object to this on the ground that it is privileged, as being a communication from client to attorney and the only copy is one that was kept in our files and was not divulged to anybody else except under an arrangement, which, as I say, I didn't suppose in any way was intended by counsel for the Federal Power Commission as one he would take advantage of. I also feel that the

matter is immaterial. I will be glad to make such disposition of this matter as the Examiner feels proper under his ruling, reserving all of my rights.

[*1298*] Trial Examiner: The Examiner feels that in this case, any right to raise the question has been waived by the inclusion of this letter in the list of those submitted under the subpoena duces tecum, and that if there is any privilege, it has been waived. I understand the question is whether—

Mr. Wahrenbrock: To put the question, Mr. Examiner, I will ask that the Examiner direct the respondent's counsel to produce copies, it being understood that his objection goes not to his being required to make copies but his being required to disclose the matter copied.

Trial Examiner: Well, in view of the response, which shows that the carbon copy of the letter has been listed as being among the items submitted, I see no reason why counsel should not turn over the copies, if that is the understanding.

Mr. Branch: Very well, sir. I do so, reserving my rights in making objection to doing so.

Mr. Wahrenbrock: Thank you.

Mr. Branch: I take it an exception is noted to your Honor's ruling in regard to this whole matter?

Mr. Wahrenbrock: I hand one of the copies which has just been handed to me, to the reporter and the other to the Examiner, and retain the third one, and ask that the reporter mark it for identification as Exhibit Number 50.

(Document is marked Exhibit Number 50 for Identification.)

[*1299*] Mr. Wahrenbrock: I offer Exhibit 50 in evidence.

Mr. Branch: I object not only on the grounds already stated, but also on the ground no materiality has been shown.

Trial Examiner: I would like to have a statement as to the purpose of this exhibit.

Mr. Wahrenbrock: Mr. Examiner, the exhibit appears on its

face to be a statement made by Alex J. Campbell, special engineer to Mr. W. E. Thoms, pursuant to a telephone request from Mr. Thoms, and it gives Mr. Thoms what it describes as a brief outline of the connections of the Connecticut Power Company, with transmission lines extending beyond the borders of the State. It is dated November 26, 1935, and I offer it as showing the knowledge upon the part of the respondent of the facts therein stated, and as showing the statement of facts upon which the opinion, which is Exhibit No. 48, was rendered. And I make this showing in order to establish the scope of the facts brought to the attention of Mr. Thoms on which his opinion was rendered.

Mr. Branch: Well, it doesn't seem to me that any of that makes it material. I don't see how Mr. Thoms' opinion is material in this case anyway. It has been admitted, I judge it, for very limited purposes, and I consequently think that is not made admissible by anything counsel for the Commission has said. I object.

Trial Examiner: It does appear, however, that this letter [*1300*] makes something of a statement of what connections there were at a certain time. As such, it will be admitted for whatever it is worth as Exhibit 50.

Mr. Branch: May I note my exception?

Trial Examiner: Exception will be noted for the respondent.

* * * * * * [*1303*]

Q And since August 26, 1935, the electric energy which the Connecticut Light and Power Company has received from the Connecticut Power Company at Bristol has been received under these contracts, Exhibit 51 and Exhibit 8 successively? *A* Yes, except as they may possibly have been modified slightly as to perhaps price, or one thing or another of that kind, by letters of which, however, I have no recollection.

* * * * * * [*1306*]

Q Are there any other modifications that you know of aside from Exhibits 9 and 10? *A* None that I know of, but I want to say this: We have a great many contracts. I am generally famil-

iar with them, but I find it difficult to be familiar with all of them in great detail. My recollection was that yesterday when I was under cross examination I had forgotten about this letter and I testified that Exhibit 8 was the contract that was in effect, and then was confronted with this letter, and I frankly hate to be submitted to a memory test because I haven't got a good memory, and I have already indicated that by having made some mistakes and admitted them. So that I have a general knowledge of these matters, although I don't execute them myself. I have talked with our officers about them, and they go ahead and carry them out.

Q So far as your present recollection goes, Exhibits 8, 9 and 10 represent the contract under which electric energy is being delivered up to the present time at Bristol? [*1307*] *A* Yes.

Mr. Wahrenbrock: Mr. Examiner, I offer Exhibits 8, 9 and 10 for Identification, in evidence.

* * * * * * [*1311*]

By Mr. Wahrenbrock: *Q* Mr. Campbell, is the Connecticut Light and Power Company considering any changes in its source of supply of electric energy at Bristol?

* * * * * *

A It is rather difficult to answer that question specifically, I mean directly. As I said when I was on the stand before, our Company is constantly, from time to time, reviewing the matters that are up in connection with the supply of power or procurement of any materials or services that we may need, [*1312*] with the hope that we may be able to find some more satisfactory way. Whether there is any active study going on now of this Bristol supply, I don't think there is. It is likely, however, that it would be studied, because if it should develop that it is economical, more economical for us to obtain our supplies from our own system, and assuming that it is feasible and practicable to do so, we would naturally desire to do so upon the termination of this contract.

To bring that about would require a determination on our part

of the proper steps to be taken quite some time in advance of the actual date of the termination of the contract, so that we could do the necessary things that would be required to be done in order to bring the change about, if it is a desirable change to make.

Q Is any such study being made at the present time? *A* None actively that I know of. It has been discussed from time to time over a period of years, that we might find it advantageous to do so at some time. We own no right-of-way which would enable us to do so, and the procurement of a right-of-way takes quite a long time, so the matter is not being actively studied at the present time.

* * * * * * [*1329*]

The Witness: Commission counsel asked me if we were considering any change in our methods of operation at Bristol, and I answered no. And that is true, but I did want to explain, because I didn't want to have any misunderstanding. The contract at Bristol provides that a two-years' notice shall be given for its termination, which notice must be given before some date—I think it is the end of 1944, and we have felt that that contract has certain disadvantages in it to us, which we feel in the renewal of a contract we would like perhaps to have changed. It has nothing to do with this question involved here of interstate commerce, and we therefore have considered—we have considered from time to time whether it would be feasible or practicable for us to introduce our own supply of power. So, preliminary to being ready to sit down some time in the future, the next two or three years, and knowing that it takes a very long time to secure a right of way, we are now studying the feasibility of securing a right of way. We are actively engaged on that merely for the purpose of putting us in a good trading position when the termination of the present contract comes. I wanted to correct that so that there would be no misunderstanding.

[*1330*] By Mr. Wahrenbrock: *Q* Do you want to augment that statement you have just made with any statement as to the pur-

poses to which you referred—purposes which you referred to as unconnected with matters here under consideration? *A* Purely economic ones. We had felt for some time that the terms and conditions under which we are in this present contract, with the Connecticut Power Company, are burdensome, and we have felt therefore that we would be in a better trading position if we are then, when that time arrives, in a position to introduce our own supply, if we are unable to make what appears to us favorable and satisfactory terms.

* * * * * * [1333]

Q Mr. Campbell, you have previously testified to the reason for the company's disconnections of the New Britain interconnection in 1936 when the Connecticut Power Company reestablished its interstate connections. Would that reason have impelled the Company to make that disconnection if by maintaining the connection it would not be subject to Federal Power Commission jurisdiction?

* * * * * * [1334]

The Witness: Well, as the Company disconnected from the Connecticut Valley Exchange because of the possible interstate complications involved, if the interstate complications were removed by some subsequent action, I would expect the Company would have restored the connection. I can't say, because I was not in control.

By Mr. Wahrenbrock: *Q* To use the form of language you have used, would it have been to the Company's interest at the time those interstate complications were removed, to remove the interstate complications at Groton?

* * * * * * [1335]

The Witness: . . . There weren't any at Groton, in my opinion, as I understood the situation at that time, as I then understood the situation.

By Mr. Wahrenbrock: *Q* When did your understanding change, Mr. Campbell? *A* I don't know that it has changed. The change

as I recall it and see it has taken place in the interpretations [*1336*] and rulings of the Federal Power Commission.

As I have said before, at this time that we are speaking of, in '35, the Act was new. It is a complicated Act and certain things were fairly clear and obvious in it. Many other things, perhaps, were not, and as we found the trend of the attitude or interpretation that was apparently being placed on the Act by the Federal Power Commission, we attempted to adjust our situation to meet those interpretations which they were placing on it.

* * * * * * [*1372*]

Cross Examination by Mr. BRANCH.

Q Mr. Campbell, in the course of your testimony you have mentioned Mr. Roraback, former president of the company. Is Mr. Roraback alive now? *A* No, he died in May, 1937.

Q And I think in the course of the testimony mention has been made of Mr. Thoms, W. E. Thoms, was it, of Waterbury—was he a lawyer? *A* Yes, he was a lawyer in Waterbury.

Q And is he alive now? *A* No, he died within, I should say two years.

Q And in the course of these—

Mr. Wahrenbrock: Excuse me. May I have the last answer read? I was unable to hear the witness.

The Witness: Mr. Thoms died within two years.

By Mr. Branch: *Q* I think you stated in your direct testimony that this opinion of Mr. Thoms and Mr. Roraback, or this letter [*1373*] which is Exhibit—well, I will look up the exhibit number. I think you stated in your direct testimony that you had never seen this opinion of Mr. Thoms until recently. *A* That is as far as I remember.

Q And at any time that Fall, did you confer with Mr. Thoms to get his views as to the legal situation in regard to any of those matters ? *A* I didn't hear the first part of your question.

Mr. Branch: Will you read it, please?

(Whereupon the last question as above recorded, was read by the reporter.)

Mr. Branch: I will change that.

By Mr. Branch: *Q* At any time during the Fall or early winter of 1935, or during the summer, or say, at any time during the year 1935, did you confer with Mr. Thoms in regard to any of these matters relating to jurisdiction of the Federal Power Commission or the Connecticut Valley Power Exchange? *A* I don't recall ever having done so.

Q And did you confer from time to time with other counsel for the company in regard to these matters? *A* Yes.

Q And who was that counsel? *A* Members of the firm of Day, Berry & Howard.

Q In Hartford? [*1374*] *A* In Hartford. And also Mr. Garfield Scott, and some one or more of his assistants who—Mr. Garfield Scott being general counsel of the United Gas Improvement Company, and we had at that time the right to call on that department, the legal department of the United Gas Improvement Company, for legal advice, with little or no cost to us, so we tried to avail ourselves of that free service.

Q You made reference in one of your answers, Mr. Campbell, when you were giving your reasons for disconnecting at New Britain and removing yourself from the Connecticut Valley Exchange, to those facilities which you felt might possibly be held that you were operating if you continued in the Exchange, and the word "connections". What facilities did you refer to by those facilities? *A* I referred to the lines which were in the control of the Connecticut Valley Power Exchange, extending up to the Massachusetts State line, and perhaps to the New York State line, if that connection was made at that time.

Q Now, in regard to the Connecticut Valley Power Exchange, I think you said in substance that the arrangement was that power which the Exchange took might be sent where the Exchange—or that the Exchange was the one that had control over the sending of that power, is that correct? *A* Yes.

Q And you knew that there were—that there was a line [*1375*] which connected Hartford with Massachusetts, the so-

called Agawam line crossing the Massachusetts State line? *A* Yes.

Q And as I understood it from you, it was contemplated in the arrangement of the Connecticut Valley Power Exchange, that power should be sent by someone along that line from time to time, is that true? *A* Yes.

Q Now, in regard to the Groton situation, was there any agreement on the part of your company at any time to furnish power to Fishers Island, or to any company on Fishers Island? *A* No.

Q Was any customer mentioned in your agreement with the Borough of Groton other than the Borough itself? *A* No.

Q And did you deliver all the power you delivered to the Borough of Groton under your agreement with the Borough of Groton? *A* We did.

* * * * * * [*1377*]

By Mr. Branch: *Q* Mr. Campbell, as far back as you can recollect, up to the time when you received notice of the order to show cause, did the Federal Power Commission or any representative of the Federal Power Commission, communicate to you in any way directly its contention that your company was a public utility within the meaning of part 2 of the Federal Power Act?

Mr. Wahrenbrock: I object to that, Mr. Examiner, as being immaterial. There is no requirement of the statute, no re- [*1378*] quirement of law, that the Federal Power Commission must first have communicated to the respondent any determination before it investigated the facts.

* * * * * *

Mr. Wahrenbrock: Mr. Examiner, it is a proposition of law that has been established as long as the country has had law that no estoppel runs against the Government.

Trial Examiner: That is very true. I think the matter may, however, have some usefulness as an explanation, and may be material to the question raised by Commission's counsel in his opening statement as to the possible request for the invocation of penalties, and we will therefor admit it.

The Witness: I never received any communication from the Federal Power Commission denying the statement which I had made [*1379*] to them several times that we were not a public utility and not subject to their jurisdiction.

Mr. Wahrenbrock: I move the reply to the question be stricken. It is immaterial what letter Mr. Campbell received.

Mr. Branch: I will follow that with a further question.

By Mr. Branch: *Q* As far as you know, did anybody representing the Federal Power Commission write any letter to your company or to any officer of your company at any time prior to the time when the order to show cause in this proceeding was served upon you, asserting that your company was a public utility within the meaning of part 2 of the Act?

Mr. Wahrenbrock: Mr. Examiner, there is already in the record evidences by Exhibits and by stipulation showing many communications from the Federal Power Commission to the respondent, serving orders upon it, addressed to public utilities.

Trial Examiner: That fact of itself does not make the testimony irrelevant. It will be admitted. You may answer the question.

The Witness: No.

* * * * * * [*1382*]

By Mr. Branch: *Q* Let me ask you this: Mr. Campbell, when you first opened negotiations recently with an officer of the Torrington Electric Light Company, which resulted in the oral agreement which you have mentioned, to obtain power from the Torrington steam plant, what was the condition of the Torrington steam plant?

Mr. Wahrenbrock: Mr. Examiner, I object to that. No basis has been laid. The witness hasn't been qualified as an engineer, hasn't been qualified that he has ever seen the plant or knows anything about it.

Mr. Branch: I don't mean a detailed explanation. I just want to know whether it was operating or getting ready to operate.

Trial Examiner: I think from that standpoint the question is admissible.

Mr. Wahrenbrock: If he knows.

Trial Examiner: With that qualification, you will answer the question.

A The Torrington steam plant had been a reserve plant held in reserve by the Torrington Electric Company for a number of years. It was included in the description of facilities of power plant capacity available for load carrying purposes [*1383*] at the conferences that were had with the War Power Committee presided over by Mr. Olds, in December, 1939. Some time ago, within a year, the Torrington Company had apparently concluded to put in an additional boiler to make that plant still more useful to it, and when I say the Torrington Company, in respect to the arrangement that is now in effect, that new boiler had been installed, but it had not perhaps been fully completed in its installation. It was not quite ready for operation, but the plant had been tuned up, looked over and was in operating condition.

Mr. Wahrenbrock: Mr. Examiner, I move that that answer be stricken, it not having been shown how Mr. Campbell obtained his information, and it appearing from all of his other testimony that he knows nothing about the facilities of any other company except his own and has no duties with respect to the facilities of any other company than his own, and can't remember anything about the facilities of any other company except his own, doesn't know whether there are any other facilities of any other company than his own.

Trial Examiner: He has stated, I believe, that he handled these negotiations. I think, perhaps, he may explain the source of his information.

The Witness: The source of the information came to our engineering department, first it came to our engineering department at the time they were compiling for this War Power Committee the [*1384*] facilities available. It was furnished by the operating department of the Torrington Electric Light

Company, to our engineering department. I saw the report, attended the conference at which the statement was made, and at which it was accepted as available capacity to the extent of 2,500 kilowatts. And I saw Mr. Travis, and I asked him if it were a fact that he had recently been overhauling his plant and installed a new boiler, so that it was now in better condition than it had been before, and able to carry our load at Winsted, and he told me that it was.

By Mr. Branch: *Q* Who is Mr. Travis? *A* He is the president of the Torrington Electric Light Company.

* * * * * * [1386]

Mr. Wahrenbrock: I will be glad to abide by the suggestion, and may the record show this is redirect? Before beginning the redirect, however, I wish at this time to ask the respondent's counsel to produce the matters concerning which he claims privilege, which are called for by the subpoena directed to the respondent, which is outstanding.

Mr. Branch: Well, that is generally a large order. Will you specify what you want?

Mr. Wahrenbrock: Everything called for by the subpoena which you have not thus far made available to me.

Mr. Branch: May I confer with my associates?

Trial Examiner: You may.

* * * * * * [1387]

Redirect Examination by Mr. WAHRENBROCK.

Q In the year 1935, at the time you were consulting with Day, Berry and Howard, and Garfield Scott, with respect to questions of Federal Power Commission jurisdiction, who owned the electric lines and facilities from New Britain interconnection with your company to the Massachusetts-Connecticut boundary?

Mr. Branch: Who owned what? May I have that question read?

Trial Examiner: The reporter will read the question.

(Question read by the reporter.)

A I think it was the Connecticut Power Company.

By Mr. Wahrenbrock: *Q* The Connecticut Light and Power Company didn't own those facilities? *A* No, not those facilities.

[*1388*] *Q* Did the Connecticut Light & Power Company maintain those facilities? *A* Again as of what date?

Q 1935. *A* Before or after the—

Q Either one. If it is different, answer differently for the portions of the year. *A* Prior to August 25th, if that is the date when the Federal Power Act went into effect, prior to that date the facilties were maintained, as I remember it, by the Connecticut Valley Exchange, and the Connecticut Light and Power Company as a member of that Exchange participated therefore directly or indirectly in that maintenance. After that date, the situation then remained the same, because the connection had been cut at the Massachusetts State Line, and that condition continued until early in 1936 when the reconnection was established at the Massachusetts State Line, and connection was broken at the New Britain point.

Q Up to approximately August 25 or 26, 1935, did the Connecticut Power Company receive a payment for the use of the lines? *A* I think they did from the Exchange, but I can't be sure. It is six years ago, and I don't carry those details in my mind.

Q I show you Exhibit 41, which is a contract between the [*1389*] Connecticut Power Company, the Hartford Electric Light Company and the Connecticut Light and Power Company, made as of the first day of January, 1931, and bearing your signature as a witness, and ask you whether, under the terms of that agreement and Article I, which reads:

> "The transportation company agrees to transmit over said transmission lines such amounts of electric energy as may be desired from time to time by the power companies, up to the capacity of said line."

And I ask you whether in view of that provision it wasn't the Connecticut Power Company that operated the Hartford-Agawam

line? *A* Apparently it was, and I would like to just explain that at the time that this contract was made, and at the time, the date as of which you were speaking, in '35, I was a vice-president of the company, particularly charged with the financial accounting and corporate features of the company, not directly connected, or had no responsibility about the plants and facilities and matters of that kind. On matters of general policy, as one of the cabinet, perhaps, if I might refer to it, I was consulted and took part in the discussions relating to that, but I witnessed this merely as I happened to be able to write, and was near at hand.

By Mr. Wahrenbrock: [*1390*] *Q* Mr. Campbell, in fairness, and to keep the record straight, shouldn't some of the statements you made about operation of the lines by the Exchange be withdrawn? *A* In the light of this contract, I should say that clearly my recollection was at fault.

Q The facilities were not operated by the Exchange but by the Connecticut Power Company? *A* Yes, I should say that is true.

* * * * * * [*1391*]

Mr. Branch: In response to the request of counsel, I hand him the following opinions:

From W. E. Thoms, addressed to Irvin W. Day, dated April 16, 1936.

Opinion of W. E. Thoms, dated April 16, 1936.

Copy of an opinion—we don't find the original, but we find a copy from Day, Berry & Howard, to Mr. Campbell, dated April 21, 1935—no, I correct that. That is October 21, 1935.

A letter from Garfield Scott to R. H. Knowlton, vice-president of the Connecticut Light and Power Company, dated April 27, 1935, with voluminous memoranda.

An opinion signed by Garfield Scott, Day, Berry & Howard, by Lawrence A. Howard. It is printed, and dated September 16, 1936.

An opinion of Day, Berry & Howard, dated March 25, 1941, [*1392*] which is mimeographed.

I am also advised that we do not have here one other opinion which is very similar to the opinion of September 10, 1936. We thought it was here, but apparently it is not, and I want to make that statement because we supply this. Mr. Howard tells me his November 24, 1936—I am informed that it is the same as the September 10th opinion, but it apparently was rendered for some reason or other.

I have a very large number of bills of counsel, which includes some items within the description of the matter relating to the subpoena. I cannot see that bills of counsel have any possible materiality, and consequently I am not handing those to counsel for the Commission.

I think that the subpoena duces tecum also asks for journal entries, for expenditures incurred in legal services. There are attached to it, I think in the case of each bill, a voucher copy, which I suppose is the same as the journal entry, but obviously I haven't the journals themselves here.

I also hand counsel the opinions which I have mentioned.

(Documents were handed to Mr. Wahrenbrock.)

Mr. Wahrenbrock: I have received what appear to be six documents, Mr. Examiner.

* * * * * * [*1400*]

Mr. Wahrenbrock: Mr. Examiner, in the few minutes, since we recessed, I have looked over these six legal opinions which were handed me by respondent's counsel at the conclusion of yesterday's session, last night's session. I have not in that time had an opportunity to have copies prepared. I should like to introduce for identification and to offer in evidence, copies of each, except the opinion dated April 27 by Garfield Scott, with its attachments, and with respect to that, I would like to introduce that opinion of one page and the five page opinion attached thereto, by K. B. Anderson, which precedes the fifty-three page memorandum by K. B. Anderson.

* * * * * * [*1401*]

Mr. Wahrenbrock: I hand the reporter for identification as

Exhibit 54, and a copy to the Examiner, the respondent having retained copies, and I having a copy, an opinion dated March 25, 1941, signed "Day, Berry & Howard", and addressed to the Connecticut Light and Power Company, 36 Pearl Street, Hartford, Connecticut.

Trial Examiner: It will be marked as Exhibit No. 54 for Identification.

(The document referred to was marked as Exhibit Number 54 for Identification.)

Mr. Wahrenbrock: I now hand the reporter and the Examiner and retain for myself copies of an opinion with reference to Public Utility Act of 1935, dated September 10, 1936, addressed to The Connecticut Light and Power Company and signed Garfield Scott, Day, Berry and Howard, by Lawrence A. Howard, and ask that it be identified as Exhibit No. 55.

[*1402*] Trial Examiner: The document will be marked Exhibit No. 55 for Identification.

(Document referred to was marked as Exhibit Number 55 for Identification.)

Mr. Wahrenbrock: Mr. Examiner, I am going to ask that each of the other four opinions which I will refer to be marked for identification, with leave to withdraw and substitute photostatic copies.

Trial Examiner: It will be so ordered.

Mr. Wahrenbrock: I would like to have the opinion dated April 16th, 1936, addressed to Mr. Irvin W. Day, The Connecticut Light and Power Company, and signed by Carmody & Thoms, by W. E. Thoms, marked for identification as Exhibit 56.

Trial Examiner: It will be marked as Exhibit 56 for Identification.

(Document referred to was marked Exhibit Number 56 for Identification.)

Mr. Wahrenbrock: And I hand Exhibit 56 for Identification to the respondent's counsel and would like to ask that the opinion dated May 27, addressed to The Connecticut Light and Power

Company, signed Carmody & Thoms, by W. E. Thoms, be marked for identification as Exhibit Number 57.

Trial Examiner: Will counsel state what year? I think that should appear upon the record.

Mr. Wahrenbrock: Under date of May 27, 1936.

[*1403*] Trial Examiner: The document will be marked Exhibit 57 for Identification.

(Document referred to was marked as Exhibit Number 57 for Identification.)

Mr. Wahrenbrock: I hand Exhibit 57 for Identification to respondent's counsel. I ask that the signed carbon copy dated October 21, 1935 of an opinion addressed to Mr. C. L. Campbell, Vice President, The Connecticut Light and Power Company, signed by Day, Berry & Howard, be marked for identification as Exhibit Number 58.

Trial Examiner: The document will be marked as Exhibit Number 58 for Identification.

(Document referred to was marked as Exhibit Number 58 for Identification.)

Mr. Wahrenbrock: Finally, I ask that the entire document, of which the first page in the form of a letter under date of April 27, 1935, addressed to Mr. R. H. Knowlton, Vice President, The Connecticut Light and Power Company, and signed by the United Gas and Improvement Company, Garfield Scott, General Counsel, together with the attachments thereto, under date of April 25, 1935, headed "The Connecticut Light and Power Company, Interstate Commerce, Mr. Garfield Scott:" and consisting of five pages, with the name "K. B. Anderson" at the end, together with the further attachment headed "Are Gas and Electric Companies Engaged in Interstate Commerce?" [*1404*] under date of April 24, 1935, and according to its pagination consisting of 53 pages, at the end of which appears the name of K. B. Anderson, be marked as a whole for identification, as Exhibit Number 59.

Trial Examiner: The document will be marked as Exhibit No.

59 for Identification. It appears necessary that the whole be introduced?

Mr. Wahrenbrock: No, sir. Having the whole marked for identification, I will have a further statement to make when it has been marked.

Trial Examiner: All right.

(Document referred to was marked as Exhibit Number 59 for Identification.)

* * * * * * [1405]

By Mr. Wahrenbrock: *Q* Mr. Campbell, you have heard described the six legal opinions which have been marked for identification as Exhibits 54 to 59, inclusive just now? *A* I have.

Q And I show you Exhibit 48 for Identification. Are those seven legal opinions so described all of the legal opinions which The Connecticut Light and Power Company, or any officer acting as an officer of the company, has received which recommend, discuss, or directly relate to or concerns any of the eight matters enumerated under paragraph 1 of the subpoena which was served upon the Connecticut Light and Power Company in this proceeding? I show you a copy of that part of the subpoena. *A* As far as I know, yes, excepting as they may have been supplemented from time to time by oral discussions of which, I presume, there may be no record.

* * * * * * [1406]

Mr. Wahrenbrock: Mr. Examiner, I would like at this time to offer each of those opinions, Exhibits 54 to 59 inclusive, in evidence, on the understanding that copies will be subsequently provided.

* * * * * * [1407]

Trial Examiner: Is there objection to their introduction in evidence?

Mr. Branch: No, sir. In view of the fact that a good deal of this matter has been gone into, I make no objection.

Trial Examiner: All right. I think with the exception of No.

59, they will now be received in evidence, and I think on account of the matter of pagination, that only a part of it is proposed to be marked later, that it is better not to show that on the record as a whole until we—

Mr. Wahrenbrock: My offer is of the part which I designated for copy.

Trial Examiner: Counsel has stated that he has no objection to the admission, so that the delay in the admission is simply for the purpose of having the record straight on the pagination. Therefore Exhibits 54, 55, 56, 57, and 58 [*1408*] are now admitted in evidence.

(The documents referred to were marked as Exhibits Nos. 54, 55, 56, 57 and 58 in Evidence.)

* * * * * * [*1409*]

Q Mr. Campbell, I show you Exhibit 35 for Identification, and ask you whether the savings realized from the operation of the Connecticut Valley Power Exchange, which you testified the Connecticut Light and Power Company ceased to share in after August 25th or 26th, 1935, had resulted in net payments to The Connecticut Light and Power Company of the sums shown on that exhibit for the preceding twelve months.

Mr. Branch: I object at this place. I think that this question was asked of some other witness and was ruled to be immaterial. And in the second place, this is not a matter that was gone into in my examination, and has no proper place.

Trial Examiner: I do not recall this question having been raised in the past examination, Mr. Wahrenbrock, or anything similar to bring it in. I doubt if the question is—

Mr. Wahrenbrock: Mr. Examiner, I don't see that any [*1410*] substantial—I don't see that any unfairness would be accomplished, and in view of the conditions under which I have been examining Mr. Campbell, I should suppose it would be only fair to permit a certain laxity. After all, the rules for confining the subsequent redirect to the limitations of the cross were for the

purpose of preventing undue prolongation of the examination of a single witness, and I think it is obvious I have been making every effort to conclude the examination of this witness.

Trial Examiner: With that in view, I think we will permit the question, which of course verges very dangerously on that situation. Counsel has stated very definitely the purpose, and it is understood that it in no way presses for any further question. You may answer the question.

The Witness: Well, sir, I don't carry in my mind the precise figure. My recollection is that it was some figure somewhere about that, and I have no reason to doubt the correctness of that figure. But I would like to make one other statement. We did not cease to participate in the Connecticut Valley Exchange in August, 1935. We continued to enjoy and participate in such benefits as there were from the operation of the Connecticut Valley Exchange, confined merely to the State of Connecticut until—I think it was early in 1936, so that it wasn't—we enjoyed during that period the same or some substantial part of the same savings.

[*1411*] *Q* After August 26th, 1935, the Turners Falls Company—I can't at the moment recall its exact corporate name—you are familiar with the company I am referring to—which had previously been a member of the Exchange and participated along with the Hartford Company and your Company, no longer participated, did it? *A* That is right.

Q And any savings which might have been realized by subsequent exchanges of power were not realized by the arrangement under which savings had previously been realized? *A* No, they were confined entirely to operations of the Connecticut companies within the State of Connecticut.

Q Yes. And after the severance of the New Britain interconnection in 1936, except for such reconnections during emergencies as may have occurred, there were no further savings from exchanges with the Hartford Company? *A* That is right, sir.

* * * * * * [*1413*]

Mr. Wahrenbrock: Mr. Examiner, I now offer in evidence in order Exhibits 32 for Identification, 33 for Identification and 34 for Identification, of which I will have copies prepared at the earliest opportunity. So far as 32 and 33 are concerned, I expect I will have copies of those within a day or two. So far as 34 is concerned, I shall have to have a photostat made which I will do promptly upon my return to [*1414*] Washington, and I will then furnish the required number of copies.

Mr. Branch: I object to these on the ground that they are immaterial and in respect of Exhibit 33 I also object on the ground that it is privileged, as I explained when the matter was first referred to, or at some time when the document was referred to yesterday.

Trial Examiner: I believe this letter is addressed to Mr. Roraback by W. E. Thoms, and the evidence shows that it was received from the Hartford or Connecticut Light Company—which was it?

Mr. Wahrenbrock: It was produced in response to the subpoena directed to The Hartford Electric Light Company and The Connecticut Power Company and Mr. Samuel Ferguson.

Trial Examiner: This matter was not, when called for, in the possession of the respondent. There is no suggestion that there was any—

Mr. Branch: (Interrupting) May I see those?

Mr. Wahrenbrock: I show them to respondent's counsel.

Mr. Branch: I think I have stated my objection, sir.

Trial Examiner: Does that complete your objection, Mr. Branch? Has your objection been fully stated?

Mr. Branch: Yes, sir. The privilege was claimed in behalf of everyone.

Mr. Wahrenbrock: Well, Mr. Examiner, I object to that [*1415*] statement. Privilege can only be claimed by Mr. Branch on behalf of his client.

Trial Examiner: The question of privilege is one which has

been plaguing us considerably during this hearing, and it is apparent in this case, however, that the documents were produced from the possession of the third party and would thus be practically, in the case of communications orally made in the presence of the third party. Documents marked for identification as Exhibits 32, 33 and 34, will be received in evidence. It will be further noted that there is no allegation made that the opinion in question was surreptitiously obtained by the parties in whose hands it was.

* * * * * * [*1421*]

HAROLD E. MILLER,

a witness called on behalf of the Federal Power Commission, being first duly sworn, testified as follows:

Direct Examination by Mr. WAHRENBROCK.

Q Will you please state your name and address. *A* Harold E. Miller, 5 East Oxford Avenue, Alexandria, Virginia.

Q What is your occupation? *A* I am an electrical engineer.

Q What was your professional schooling? *A* I was graduated from Cornell University, degree of electrical engineering.

Q What is your position with the Federal Power Commission? *A* I am employed by the Federal Power Commission as an assistant electrical engineer.

Q How long have you been with the Federal Power Commission? [*1422*] *A* I have been employed by the Federal Power Commission since May, 1939.

Q Will you describe your duties? *A* I assemble engineering data and make the necessary studies which enable me to prepare preliminary drafts of engineering reports of electric utilities. In connection with this work, I study the operations of their systems, including loads and output of their generating stations, their wholesale energy transactions, and demands and energy consumption of their transmission networks and substations, to determine the direction and amount of energy flow over their lines, and

through their substations. I make field investigations, check operating data, and observe facilities and methods of operation whenever necessary. I prepare exhibits, tabulations, and data for use at hearings conducted under the authority of the Commission.

Q Have you made a study of the supply of electric energy to the electric utility system on Fishers Island in the State of New York, and to electric utility systems of the Connecticut Light and Power Company located at and near East Hampton, Bristol and Winsted, Connecticut, respectively? *A* I have.

Q What periods of time did that study cover? *A* In general, the period of time from the passage of the Federal Power Act to date was covered. More extensive [*1423*] study was made of the operations since 1937.

Q What data was utilized in that study? *A* Log sheets of The Connecticut Valley Power Exchange and Housatonic division of The Connecticut Power Company, photostats of R.A. and printometer charts from meters at Torrington, tabulated and other data from The Connecticut Power Company, The Torrington Electric Light Company, The Connecticut Light and Power Company, and The Hartford Electric Light Company; annual reports, power system statements, and other reports of The Connecticut Light and Power Company, The Connecticut Power Company, The Hartford Electric Light Company, The Torrington Electric Light Company, the Borough of Groton Utilities, the Western-Massachusetts companies. From this group combined power system statements were consulted, but these companies report separately in their annual reports.

Also power system statements and annual reports of the Fishers Island Farms, Incorporated, and of other companies. The FPC files of The Connecticut Valley Power Exchange, The Connecticut Light and Power Company, Fishers Island Farms, Incorporated, their application to sell properties to Fishers Island Electric Corporation, information obtained orally from engineers, executives, and operating men of The Connecticut Power Company,

The Connecticut Light and Power Company, and The Hartford Electric Light Company.

I have made two field trips in respect to this matter, [*1424*] one of five days, and the other, I believe, of eight days.

Q In your statement you have referred to "R.A. charts". What do you mean by R.A. charts? *A* R.A. charts are charts drawn by a curve drawing meter, which enable determination of the demand during certain definite periods, such as fifteen minutes or thirty minute periods.

Q You refer to FPC files. Will you explain what you meant by FPC files? *A* I was referring to the files of the Commission which are available to me in my work.

Q Did you view or study any of the facilities involved? *A* Yes.

Q Will you generally describe the extent of your field investigation? *A* I have visited the South Meadow, West Side, Thomaston, Torrington, and Falls Village substations of The Connecticut Power Company, various points in the Middletown division of The Connecticut Power Company, and the Falls Village generating plant of The Connecticut Power Company. I have visited the Bristol, Winsted, and Torrington substations of The Connecticut Light and Power Company. I have also visited Gaylordsville, Thomaston, Putnam, and other points in The Connecticut Light and Power Company system. I visited the substation of The Torrington Electric Light Company. I also [*1425*] visited the substations at Groton and Groton Long Point, and other points in Connecticut. I viewed the CP-1 and CP-2 lines at various points between Hartford and Falls Village.

Q What do you mean by the CP-1 and CP-2 lines? *A* Those are lines extending from the South Meadow substation of The Connecticut Power Company to the Falls Village generating plant at Falls Village.

Q And where is the South Meadow station of The Connecticut Power Company to which you have referred? *A* The South Meadow substation of The Connecticut Power Company is in

Hartford, you might say adjacent to the South Meadow plant of The Hartford Electric Light Company.

Q In stating the results of your study, is it convenient for you to group the various systems or parts of systems of The Connecticut Light and Power Company? *A* Yes. East Hampton, Bristol, and Winsted operations of The Connecticut Light and Power Company can be conveniently grouped together as they have a common source of supply from the Connecticut Power Company, CP-1 and CP-2 lines. The operations involved in the Borough of Groton are separate and distinct from these.

Q Will you describe all the sources of supply of electric energy within the State of Connecticut from which the electric energy requirements of Bristol, East Hampton, and Winsted districts could be supplied with the then existing [*1426*] facilities during the period covered by your study. In making that description, I would like to ask, will it be convenient for you to refer to a diagram? *A* Yes. I have a diagram.

Q Will you produce it, please? *A* (Handing document to counsel.)

Q Thank you.

Mr. Wahrenbrock: I hand the respondent's counsel a sheet of paper which bears the legend, "One line diagram". I hand a copy to the Examiner, and I ask that the other copy be marked for identification as Exhibit No. 60.

Mr. Branch: Have you additional copies of this that you can supply to us? It is going to be rather difficult for all of us to follow this on this one small sheet.

By Mr. Wahrenbrock: *Q* Have we any other copies of this, Mr. Miller? *A* I did have one more, but I have been unable to locate it.

Mr. Wahrenbrock: I have only the one copy for myself. It was an oversight on my part. I hadn't anticipated your necessities.

The Witness: I have a negative that you could make some additional positives, somewhere in my papers, I believe.

Mr. Branch: It would be a great—apparently this is something that is going to be referred to in his testimony, [*1427*] and naturally it is a little difficult for all of us to look at this one small sheet.

Mr. Wahrenbrock: Can the witness be excused long enough to find the negative which I will be glad to loan to respondent's counsel?

Trial Examiner: We will take a five-minute recess.

(At this point a short recess was taken, after which the hearing was resumed.)

[*1428*] Trial Examiner: The hearing will now be in order.

Mr. Wahrenbrock: I hand respondent's counsel another positive.

Mr. Branch: Thank you.

Mr. Wahrenbrock: I ask that the copy I have handed the reporter be marked for identification as Exhibit Number 60.

Trial Examiner: It will be marked Exhibit Number 60 for Identification.

(Document referred to was marked Exhibit Number 60 for Identification.)

By Mr. Wahrenbrock: *Q* I place Exhibit Number 60 for Identification before you, Mr. Miller, and ask you if that exhibit was prepared in accordance with your instructions and under your direction? *A* It was.

Q With that exhibit before you, will you describe all the sources of supply of electric energy within the State of Connecticut from which the electric energy requirements of the Bristol, East Hampton and Winsted Districts of The Connecticut Light and Power Company could be supplied with the then existing facilities, during the period covered by your study?

Mr. Branch: Will you read just the first part of that question, please?

Trial Examiner: Will the reporter read back the question?

(Question read by the reporter.)

[*1429*] Mr. Branch: May we state as of what date?

Mr. Wahrenbrock: Yes, during the period covered by his study, which has been fixed. *A* The Falls Village Electric Plant of The Connecticut Power Company and the plants of The Hartford Electric Light Company were sources of supply of Connecticut-generated energy in the Bristol District, the Winsted District and prior to July 1, 1939, the East Hampton District. Referring to the diagram, the Falls Village plant is shown at the left hand side of the diagram marked at the point where it is marked "Falls Village Plant and Substation". The plants of The Hartford Electric Light Company are not shown on the diagram but on the right-hand side of the diagram there is an 11 kv. bus at South Meadow, of The Hartford Electric Light Company indicated. In addition to these sources, the Robertsville hydro-electric plant of the Connecticut Light and Power Company, and prior to September, 1938, the Leesville Hydro-electric Plant of The Connecticut Light and Power Company were sources of supply of Connecticut-generated energy to Winsted and East Hampton Districts, respectively. The Robertsville plant is shown on the top of the diagram. None of the facilities in the East Hampton District are shown in this diagram, but the East Hampton District was connected to The Connecticut Power Company's lines at the point marked [*1430*] "To Portland".

Trial Examiner: Will you repeat that?

The Witness: The East Hampton District of The Connecticut Light and Power Company was connected to The Connecticut Power Company lines at a point approximately where it says "To Portland" in the lower part of the diagram.

Trial Examiner: Thank you.

The Witness: An industrial customer of The Connecticut Light and Power Company was also the source of a small amount of energy to The Connecticut Light and Power Company in its East Hampton District. The steam plant of The Torrington Electric Light Company could possibly have been a source of supply to the

Winsted District, although it apparently was not used even in the face of the disasters of 1936 and 1938.

By Mr. Wahrenbrock: *Q* Will you describe in a general way the electric facilities by which those sources have been connected to those loads? *A* The Connecticut Power Company owned and operated a 66 k. v. double-circuit three-phase transmission line from Hartford to Falls Village, known as the C. P. 1 and C. P. 2 lines. These lines are indicated on the diagram in about the center of the diagram and they are marked C. P. 1 and C. P. 2. These lines terminated at the west end in the Falls Village [*1431*] Substation and at the east end in the South Meadow Substation in Hartford. They were tapped to supply energy to the Middletown Division of The Connecticut Power Company, to Bristol District of The Connecticut Light and Power Company, to the Thomaston Division of The Connecticut Power Company and to The Torrington Electric Light Company at Torrington. At Falls Village a single-circuit line, known as the E-line, extended to the New York border, where it interconnected with the line of the Central Hudson Gas & Electric Corporation, The Falls Village plant of The Connecticut Power Company was connected to the C. P. 1 and C. P. 2 lines through the Falls Village Substation. The Hartford Electric Light Company was connected to the C. P. 1 and C. P. 2 lines through the South Meadow Substation. Prior to July 1, 1939, the East Hampton District of The Connecticut Light and Power Company was supplied from a 13.8 k. v. circuit at a point in Portland known as Pole No. 110. This 13.8 k. v. circuit extended from the West Side Substation of the Middletown Division, which, as I have just stated, received energy from a tap from the C. P. 1 and C. P. 2 lines. The Bristol District of The Connecticut Light and Power Company received its entire electric energy supply from the C. P. 1 and C. P. 2 lines. During the period of time covered by my study, the Win- [*1432*] sted District of The Connecticut Light and Power Company got greater part of its electric energy from The Torrington Electric Light Company, which in turn got all its

electric energy requirements from the C. P. 1 and C. P. 2 lines, except for a small amount from the Winsted District at times. The energy was received at the Torrington Substation of the Connecticut Power Company, where the voltage was stepped down from 66 k. v. to 2.3 k. v. for the supply of The Torrington Electric Light Company's service area and for the sale by The Torrington Electric Light Company to the Winsted District of The Connecticut Light and Power Company. The Connecticut Light and Power Company owned a substation at Torrington at which it stepped up the voltage so that the energy received from The Torrington Electric Light Company was transmitted to Winsted at 27.6 k. v. During good water season, the Winsted District received some energy from the Robertsville Plant of the Winsted District.

Q Will you please describe all other sources of supply of electric energy from which the requirements of the Winsted, Bristol and East Hampton systems could have been supplied, during the period of time covered by your study, with the then-existing facilities, in a general way?

Mr. Branch: I object on two grounds. One is that it does not appear that we contracted for any such source of supply, or that The Connecticut Power Company contracted.

[*1433*] Secondly, it does not appear yet that this witness has sufficient knowledge in order to make a statement of that kind.

Mr. Wahrenbrock: Mr. Examiner, the fact that there is no present existing contract under which the energy received was received is, as I have argued earlier, entirely immaterial. There need not be a pre-existing contract to sell goods which are actually sold in interstate commerce, or to sell services which are actually sold in interstate commerce, prior to the actual sale, in order that the sale in interstate commerce shall be a sale in interstate commerce. With respect to the second point, the witness has stated that he has made a study of the transactions and the facilities, and we shall develop what that study showed.

Mr. Branch: Well, certainly he should first develop what his

study showed, and it may then become more apparent or less apparent that he is in a position to answer this question.

Trial Examiner: I think his general statements of his knowledge will serve for the present, and the objection is overruled and the question may be answered.

By Mr. Wahrenbrock: *Q* Will you answer the question, Mr. Miller? *A* The plants of the Turners Falls Electric Company and its affiliated companies in Massachusetts and other companies [*1434*] in Massachusetts with which it is interconnected, also the plants of the Central Hudson Gas & Electric Corporation in New York, and other companies in New York and New Jersey with which the Central Hudson Gas & Electric Corporation is interconnected.

Q Will you indicate by referring to Exhibit 60 the facilities by which energy from those sources could have been supplied?

Mr. Branch: May it be stipulated that my objection runs to this whole line of inquiry based upon the last answer, or matters similar to it, so I won't have to keep interrupting?

Trial Examiner: It will be so understood.

A The Turners Falls Power and Electric Company, owned and operated the 66 k. v. double-circuit line from its Agawam Substation in Massachusetts to the Massachusetts-Connecticut border, where it interconnected with The Connecticut Power Company's lines which extended to the South Meadow Substation in Hartford.

By Mr. Wahrenbrock: *Q* Are those lines that you have last referred to indicated on Exhibit 60 for Identification? *A* The lines are shown on the exhibit, but they are not identified as to which is C-3 and D-4. They are the lines in the upper right-hand corner of the diagram shown extending from beyond the Massachusetts-Connecticut border, down to the [*1435*] South Meadow Substation of The Connecticut Power Company. These lines were known both in Massachusetts and Connecticut as the C-3 and D-4 lines. At the South Meadow Substation two 25,000 k.v.a. autotransformers were provided to adjust the voltage between the C-3

and the D-4 lines, and the C. P. 1 and C. P. 2 lines. The Central Hudson Gas & Electric Corporation maintained at the New York-Connecticut border an interconnection with the E-line of The Connecticut Power Company which extends to the Falls Village Substation of The Connecticut Power Company.

Q Does that complete your reference to Exhibit 60 for Identification? *A* I think so.

Q Will you please describe in a general way the electric—

Mr. Wahrenbrock: I will withdraw that question.

Q Did the sources to which you have referred supply other loads? *A* They did.

Q Can you indicate in general terms what some of those other loads were? *A* The Falls Village plant supplied the load of the Connecticut Power Company divisions along the C. P. 1 and C. P. 2 lines. The Hartford Electric Light Company plants supplied the loads of that company and of the Farmington Valley Division of the Connecticut Power Company, and some of the loads on the [*1436*] C. P. 1 and C. P. 2 lines. The plant of The Turners Falls Power and Electric Company and affiliated companies supplied the load of their own service area and of their wholesale customers.

Q Was the generating capacity of The Torrington Electric Company operated to supply any electric energy to any loads during the period covered by your study? *A* Not to any appreciable extent. The Torrington Electric Company reports generation of zero kilowatt hours in 1936, 1,700 kilowatt hours in 1937, 1,500 kilowatt hours in 1938, zero kilowatt hours in 1939, and 50 kilowatt hours in 1940. The plant was kept as a cold standby by The Torrington Electric Light Company, subject to call by The Connecticut Power Company.

Q What was the capacity of the Robertsville plant, and what is the relation of its capacity and its annual output to the load and annual energy consumption of the Winsted District of The Connecticut Light and Power Company? *A* Its nominal installed capacity is 500 k. w. Its actual capacity is about 30 per cent greater

than that, as shown by records. The plant has no appreciable storage, so that it can operate regularly only during good-water season. At other times its operation is irregular. Since the annual peak load of the Winsted District has varied from 1,200 k. w. for the year 1936 to 2,032 k. w. for the year 1940, it is ap- [*1437*] parent that the plant when operating at full load cannot take care of the peak load. The annual generation at Robertsville, and the net energy for the system of the Winsted District have been respectively 1,743,910 and 5,067,910 kilowatt hours for the year 1936; 2,677,780 and 6,084,980 kilowatt hours for the year 1937; 2,421,300 and 6,092,500 kilowatt hours for the year 1938; 1,622,370 and 7,595,970 kilowatt hours for the year 1939; 1,624,620 and 8,384,820 kilowatt hours for the year 1940. From these figures it is apparent that the Robertsville generation is much too small to take care of the annual energy requirements of the Winsted District.

[*1438*] Trial Examiner: Mr. Miller, do I understand that in each case the first figure is the generation, and the second figure the consumption in the district?

The Witness: It is what we call "net energy" for the system.

Mr. Branch: Excuse me. We had some difficulty in hearing that, even before the train competed with Mr. Miller, and more afterwards. May we have the answer read?

(Whereupon the last two questions and answers as above recorded, were read by the reporter.)

Mr. Branch: May this be off the record?

Trial Examiner: I think it might be well to have it on. Does the respondent's counsel understand the terms used by the witness?

Mr. Branch: I don't understand the term "net energy for the system".

Trial Examiner: Will the witness explain the meaning of that term?

The Witness: That is a term used in the Power System Statement in which the generation of a system and its purchases and

wholesale sales are added or subtracted in proper way, and the net result is the net energy for the system.

By Mr. Wahrenbrock: *Q* Mr. Miller, when you say in a proper way, will you explain which is added and which is subtracted. [*1439*] *A* I realize that. To the generation of the system there is added the wholesale purchases of energy; from the sum of this generation and wholesale purchases, the wholesale sales of the system are deducted. The difference is net energy for the system.

Mr. Wahrenbrock: Is it all right with respondent's counsel if I proceed?

Mr. Branch: Yes. We can now try to get fuller understanding from other sources.

By Mr. Wahrenbrock: *Q* Mr. Miller, do the facts you have referred to indicate that the Robertsville plant was not the exclusive source of electric supply of the Winsted system? *A* Yes.

Q Is the Robertsville plant a dependable source of supply? *A* No. In dry seasons it doesn't operate.

Q Was the Winsted district of the Connecticut Light and Power Company dependent upon electric energy purchased from the Torrington Electric Light Company? *A* Yes. The Winsted district was entirely dependent upon Torrington Electric Light Company for its energy supply, when the Robertsville plant was not operating. Even in good water season the Torrington Electric Light Company supplied part of the requirements of the Winsted district during the heavy load [*1440*] hours of the day. However, in good water season the Robertsville plant system supplied some energy to Torrington during the early morning hours, Sundays, and holidays.

Q Has the Winsted district of The Connecticut Light and Power Company been entirely dependent upon electric energy supplied to it by The Torrington Electric Light Company at times, during the period covered by your study? *A* Yes. The Winsted district of The Connecticut Light and Power Company has been entirely dependent upon electric energy supplied to it by The Torrington

Electric Light Company, at all times when the Robertsville plant was operating. I am unable to state the number of hours the Robertsville plant was operated in any year, due to the omission of The Connecticut Light and Power Company to supply that information in its annual report on FPC form No. 1. However, on the days which I selected for particular studies for other reasons, I found numerous instances of the plant not operating.

Q During the period that Winsted has been securing part or all of its energy requirements from The Torrington Electric Light Company, how were the electric energy requirements of The Torrington Electric Light Company supplied? *A* The Torrington Electric Light Company was supplied by The Connecticut Power Company through its interconnection wih the CP-1 line, which supplied all of The Torrington Electric Light Company's requirements, except for the com- [*1441*] paratively negligible amount which may have been delivered to The Torrington Electric Light Company from the generation of the Robertsville plant.

Q What was the amount of electric energy purchased by The Torrington Electric Light Company for each of the years covered by your study? *A* The Torrington Electric Light Company purchased from The Connecticut Power Company 23,244,000 kilowatt hours for the year 1936; 25,222,000 kilowatt hours for the year 1937; 23,280,000 kilowatt hours for the year 1938; 28,685,000 kilowatt hours for the year 1939; and 31,437,000 kilowatt hours for the year 1940.

Q What was the amount of electric energy received by The Torrington Electric Light Company from the Winsted district of The Connecticut Light and Power Company? *A* The Torrington Electric Light Company received from the Winsted district of The Connecticut Light and Power Company, 154,400 kilowatt hours for the year 1936; 138,400 kilowatt hours for the year 1937; zero kilowatt hours for the year 1938; 60,000 kilowatt hours for the year 1939; and 22,000 kilowatt hours for the year 1940.

Q During the period covered by your study, how were the elec-

tric energy requirements for the Bristol district of The Connecticut Light and Power Company supplied? *A* The Bristol district of The Connecticut Light and [*1442*] Power Company were supplied by The Connecticut Power Company with all its energy requirements through its interconnection with the CP-1 and CP-2 lines.

Q What was the amount of electric energy purchased by the Bristol district of The Connecticut Light and Power Company for each of the years covered by your study? *A* The Bristol district of The Connecticut Light and Power Company purchased from The Connecticut Power Company, 45,927,000 kilowatt hours for the year 1936; 60,107,000 kilowatt hours for the year 1937; 39,804,000 kilowatt hours for the year 1938; 55,280,000 kilowatt hours for the year 1939; and 65,474,000 kilowatt hours for the year 1940.

Q During the period covered by your study, how were the electric energy requirements of the East Hampton district of the Connecticut Light and Power Company supplied? *A* The electric energy requirements of the East Hampton district of The Connecticut Light and Power Company were supplied in part from its interconnection with The Connecticut Power Company at Portland, in part from the generation of its Leesville plant, and to a comparatively small extent from energy delivered to it by an industrial company, the Brownell Company.

Q Does that answer cover any time after July 1, 1939? *A* No. I have limited my study of this district to the period prior to July 1, 1939.

[*1443*] *Q* What was the amount of electric energy purchased by the East Hampton district of The Connecticut Light and Power Company from The Connecticut Power Company for each of the years covered by your study? *A* The East Hampton district of The Connecticut Light and Power Company purchased from The Connecticut Power Company, 3,543,420 kilowatt hours for the year 1936; 2,756,160 kilowatt hours for the year 1937; 3,577,920 kilowatt hours for the year 1938; and 2,258,688 kilowatt hours for the half year ending June 30, 1939.

Q What was the amount of electric energy generated by the Leesville plant for the period of time covered by your study? *A* The Leesville plant generated 1,519,485 kilowatt hours in the year 1936; 2,050,230 kilowatt hours for the year 1937; and 1,548,877 kilowatt hours for the year 1938. This plant was destroyed in the hurricane and flood of September, 1938.

Q What was the amount of electric energy purchased by the East Hampton district from the Brownell Company? *A* The East Hampton district of The Connecticut Light and Power Company purchased from the Brownell Company, 116,250 kilowatt hours for the year 1938; 92,550 kilowatt hours for the year 1937; 115,520 kilowatt hours for the year 1938; and 116,130 kilowatt hours for the year 1939. Note [*1444*] that the figure given for the year 1939 is for the entire year 1939, whereas the figure of purchases from The Connecticut Power Company included only the first six months of 1939.

Q Were you able to ascertain what the amount purchased from the Brownell Company for the first six months of the year 1939 amounted to? *A* I obtained the figures on the purchases from the Brownell Company from the report of The Connecticut Light and Power Company, its annual report, and also the power system statements. I made no effort to secure any information as to the Brownell Company's sales to The Connecticut Light and Power Company for the first six months of 1939.

Q Did either that statement or that report to which you have referred show the amounts by months? *A* Neither the annual report nor the power system statement shows the purchases by months. The figures given therein are annual figures.

Q At what point was energy delivered to the CP-1 and CP-2 lines? *A* Falls Village substation and South Meadow substation. Also, rather infrequently, from Central Hudson Gas & Electric Corporation.

Q Where did the Falls Village substation receive that energy from? *A* The Falls Village hydro-electric generating plant.

[*1445*] *Q* Did the CP-1 and CP-2 lines ever deliver energy to the Falls Village substation? *A* Yes. Whenever the Falls Village plant generation was zero or less than Housatonic division load.

Q Did the Falls Village plant deliver all its generation to the CP-1 and CP-2 lines? *A* No. Part of its generation was used to supply the Housatonic division of The Connecticut Power Company.

Q Where did the South Meadow substation obtain the energy delivered to the CP-1 and CP-2 lines? *A* The Hartford Electric Light Company at South Meadow substation and Turners Falls Power and Electric Company in Massachusetts.

Mr. Branch: I object and ask that the answer be stricken out on the ground no basis for such a statement has been shown.

Trial Examiner: Does counsel for the Commission desire to be heard on that?

Mr. Wahrenbrock: Mr. Examiner, that doesn't require a basis. That is the fact.

Trial Examiner: I think that that may develop.

Mr. Branch: May we have the question and answer read, please?

Trial Examiner: The reporter will read the question for the benefit of counsel for the respondent.

(Whereupon the last question and answer as above recorded, [*1446*] were read by the reporter.)

Trial Examiner: I think there is plenty of basis laid for the witness's statement, as to his qualifications to know the fact. The motion to strike is overruled. Exception will be noted for the respondent.

By Mr. Wahrenbrock: *Q* Were there any other possible sources of supply to the CP-1 and CP-2 lines?

Mr. Branch: The same objection. Objection based upon the same reason that I stated in my motion to strike.

Trial Examiner: The objection will be overruled and exception noted. You may answer the question.

The Witness: Yes. The Torrington plant whose generation has been negligible in the years covered by the study was a possible source of supply. I do not consider the Robertsville plant because its output is considerably less than the total load at Winsted and Torrington.

By Mr. Wahrenbrock: *Q* So that, for all practical purposes, Falls Village and South Meadow substations were the only points through which CP-1 and CP-2 lines received electric energy? *A* Yes.

Q Do the CP-1 and CP-2 lines ever deliver energy to the South Meadow substation? [*1447*] *A* Yes. When the Falls Village generation exceeded the loads of divisions and systems attached to CP-1 and CP-2 lines, and CP-1 and CP-2 lines delivered energy to the South Meadow substation.

Q When you say energy was received by a line from a substation, what do you mean? *A* I mean energy from one or more generating plants was transmitted through a substation to the load supplied by that line.

Mr. Branch: I also ask to have that stricken out on the same ground.

Mr. Wahrenbrock: I submit—

Trial Examiner: The motion to strike is rejected. Exception will be noted. Counsel may proceed with the questioning.

By Mr. Wahrenbrock: *Q* When you say energy was delivered to a substation by a line, what do you mean?

Mr. Branch: May it be stipulated I have an objection to all questions of this nature, without my interrupting?

Trial Examiner: It is so understood.

Mr. Wahrenbrock: Mr. Examiner, if it could be understood, it might be so understood, but there is nothing in common between the objection, or the questions to which objection was previously made, and these questions. Certainly the witness may explain the terminology he uses.

[*1448*] Mr. Branch: Very well. I will object after each question then.

Mr. Wahrenbrock: Suit your own convenience.

Trial Examiner: I think that is a matter for the determination of the Trial Examiner, as to the similarity of questions. Counsel may proceed.

Mr. Wahrenbrock: There is a pending question. Will you read it, please?

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: I mean energy from one or more generating plants was transmitted by a line through a substation to the loads served from that substation.

By Mr. Wahrenbrock: *Q* Do you mean to say that energy comes to rest in a substation or is interrupted in its passage? *A* No. The expression received by or delivered to a substation is convenient to use, and avoids the rather stilted language which a more exact expression would require. We often speak of a train passing through a station at which it does not stop, as just arriving or just leaving the station.

Q Did the South Meadow substation at times receive energy from the CP-1 and CP-2 lines?

Mr. Branch: Same objection.

Trial Examiner: The objection is overruled.

A Yes.

[*1449*] By Mr. Wahrenbrock: *Q* Did the South Meadow substation deliver energy to the C. P. 1 and C. P. 2 lines at times? *A* Yes.

Q Did the South Meadow substation at times deliver energy to The Hartford Electric Light Company? *A* Yes.

Q Did the South Meadow substation at times receive energy from The Hartford Electric Light Company? *A* Yes.

Q What facilities were used during the period of your study, to supply electric energy to The Hartford Electric Light and to receive electric energy from The Hartford Electric Light Company at South Meadow substation?

Mr. Branch: Same objection.

Trial Examiner: The objection is overruled.

A Three 66-11 kv. 3-phase transformers at South Meadow substation which were operated in parallel to interchange electric energy between The Connecticut Power Company and the Hartford Electric Light Company.

Q Will you indicate by reference to Exhibit 60 for Identification, the location of those 3-phase transformers to which you refer? *A* The transformers are indicated on Exhibit No. 60 at the right-hand side of the exhibit. They are the three trans- [*1450*] formers which are shown as being connected to the 11 kv. bus at South Meadow.

Q Have you completed your answer to my question? *A* No.

Q Will you continue? *A* Two of these transformers have 12,000 capacity each and a third has a capacity of 19,200 kilowatts. Recently two 110-11 kv. three-phase transformers have been set up at the South Meadow Substation. One of these transformers has been used to connect the line D-4 to the 11 kv. bus of the Hartford Electric Light Company. Line D-4 now is being operated at 110 kv. and is, of course, no longer connected to the 66 kv. bus at South Meadow.

Q In giving the capacity of the three transformers as 12,000 for two and 19,200 for the other, is that capacity properly expressed in kilowatts or in k.v.a.? *A* I am sorry. The capacity of a transformer should always be expressed in k.v.a.

Q And did you mean to express it in k.v.a.? *A* I did.

Trial Examiner: Will the witness state one thing. For the benefit of those of us who are not necessarily familiar with engineering design and diagram, will you state what symbol has been used here on this diagram to indicate the transformers?

Mr. Wahrenbrock: I think that is very appropriate, Mr. [*1451*] Examiner.

The Witness: The symbol of a transformer is usually, on a one line diagram, a sort of a wiggly line, a series of short lines going

at angles to one another. The best expression I can use is a wiggly line.

Trial Examiner: Perhaps a zig zag line will best describe it.

The Witness: Yes, a zig zag line, and you will notice on the Exhibit No. 60 that at the South Meadow Substation there is an 11 kv. bus indicated, and then there is shown three lines extending from that vertical line, which is the bus, a short distance, and then these three zig zag lines are shown, which represent in each case one side of the transformer, and then the other three zig zag lines close to it represent the other side of the transformer.

Trial Examiner: I think with that explanation it is much easier to follow the testimony of the witness.

By Mr. Wahrenbrock: *Q* Did the South Meadow Substation at times deliver energy which went to The Turners Falls Power and Electric Company? *A* Yes.

Mr. Branch: I move to strike that out on the same ground.

Trial Examiner: The motion is overruled.

By Mr. Wahrenbrock: [*1452*] *Q* Did the South Meadow Substation at times receive energy which came from The Turners Falls Power and Electric Company?

Mr. Branch: Objection on the same ground.

Trial Examiner: The objection is overruled. *A* Yes.

By Mr. Wahrenbrock: *Q* What lines were used to connect the South Meadow Substation, with Turners Falls Power and Electric Company facilities?

Mr. Branch: May it be stipulated I have an objection to this line of inquiry without objecting to each question?

Trial Examiner: It is so understood. You may proceed.

A Until recently, South Meadow Substation was connected to The Turners Falls Power and Electric Company by means of two 66 kv. Hartford-Agawam lines, and the auto-transformers at South Meadow Substation. The Connecticut Power Company owned the lines to the Massachusetts border and The Turners Falls Power and Electric Company the section in Massachusetts. Since

the 110-11 kv. transformers were put in service, one of the lines is operating at 110 kv. and the energy received from that line is delivered to the 11 kv. bus of The Hartford Electric Light Company.

By Mr. Wahrenbrock: *Q* Mr. Miller, in order that we may understand this [*1453*] engineering phraseology, will you explain what kv. what the expression kv. means? *A* "kv." means thousands of volts.

Q What does the expression which you used in referring to the transformers, k.v.a. mean? *A* It means kilo-volt-amperes, or thousands of volt amperes.

Q What lines were used in the delivery of electric energy to Middletown.

Trial Examiner: Before we pass to that point, Mr. Wahrenbrock, I would like to ask the witness what symbol indicates the presence of the auto-transformers referred to.

The Witness: On Exhibit 60 the auto-transformers are indicated by a single zig-zag line and the connections to that zig-zag line being made at different points.

Trial Examiner: I just wanted to verify my own idea in that matter. Thank you.

By Mr. Wahrenbrock: *Q* While we are getting this matter of phraseology and symbols established, I would like to ask the witness if he will refer to Exhibit 60 for Identification, to the Bristol Substation, and point out and describe the symbol for a three-winding power transformer. *A* Well, the Bristol Substation is shown there at the right center of the Exhibit 60, and in that substation there is shown from the bus marked "66 kv." two short lines extending [*1454*] to two zig-zag lines which represent a winding of each of the two transformers. Then there is shown just above those zig-zag lines another pair of zig-zag lines extending to the 4.6 kv. bus. That represents the second winding on each of the transformers. Just above the second zig-zag lines there is a pair of zig-zag lines with a line extending to the 13.8

kv. bus. Those third zig-zag lines represent the third winding of each of the transformers.

Q I now repeat the question which I previously asked; what lines were used in the delivery of electric energy to Middletown? *A* The C. P. 1 and C. P. 2 lines were tapped at a place known as Point No. 12. A line about 7.53 miles long extends to the West Side Substation in Middletown. Prior to the completion of the West Side Substation the Middletown tap extended to the Cromwell Substation in Middletown.

Q How were The Connecticut Power Company's requirements for Portland and The Connecticut Light and Power Company's requirements for its East Hampton District supplied during the period covered by your study, prior to July 1, 1939? *A* Two 13.8 kv. lines extended from the West Side Substation across the river to the Wolcott Lane Substation. From there a wood pole line extended to a point known as Pole No. 110 in the town of Portland, where, up until July, 1939, The Connecticut Light and Power Company received electric [*1455*] energy for its East Hampton Division. Prior to the completion of the West Side Substation Portland was supplied from the Water Street Substation in Middletown.

Q Until July, 1939, was the delivery by The Connecticut Power Company to The Connecticut Light and Power Company at Pole 110 the exclusive source of supply of the energy requirements of the East Hampton District of The Connecticut Light and Power Company?

Mr. Branch: Excuse me. May I have that read?

Trial Examiner: The reporter will read back the last question, for the benefit of respondent's counsel.

(Question read by reporter.)

A No, until September, 1938 the supply for this district was partly from the Leesville Hydro-electric Plant. This plant was destroyed in the storm of September, 1938, after which the Portland supply was the sole supply, or I really should say practically the sole supply until some time prior to July 1, 1939. An indus-

trial customer annually supplied a small amount of energy to the East Hampton District of the Connecticut Light and Power Company.

By Mr. Wahrenbrock: *Q* What facilities were used to deliver electric energy to Bristol, to the Bristol District of the Connecticut Light and Power Company? [*1456*] *A* The C. P. 1 line and C. P. 2 line were tapped at a point known as Tower 474. Two lines about 1.83 miles long extended to the Bristol Substation of The Connecticut Light and Power Company.

Q What facilities were used to deliver electric energy to The Torrington Electric Light Company? *A* At a point about 2.24 miles from Torrington, the C. P. 1 line from the east and the C. P. 1 line from the west, instead of joining, were connected to lines extending into Torrington to a substation of The Connecticut Power Company on the property of The Torrington Electric Light Company. At the Torrington Substation the voltage was stepped down to 2.3 kv. for the delivery of energy to The Torrington Electric Light Company.

Q Did The Torrington Electric Light Company sell that energy which it received at wholesale for resale? I haven't expressed my question well. Did it sell at wholesale for resale any of that electric energy which it received? *A* Yes, to The Connecticut Light and Power Company, and the latter received the energy at 2.3 kv. transmitted it to its nearby substation, where the voltage was stepped up to 27.6 kv. at which voltage the energy was transmitted to Winsted, a distance of about ten or eleven miles.

Q I will put this question to you, please. In your study, [*1457*] did you ascertain that there were any periods of time in which only electric energy from Massachusetts was supplying requirements of the load supplied by The Connecticut Power Company's 66 kv. line from Hartford to Falls Village?

Mr. Branch: May I have that read? I am willing to stipulate that is a question by Mr. Wahrenbrock, but I would like to have it read.

Trial Examiner: The question will be read for the benefit of respondent's counsel.

(Question read by the reporter.)

Mr. Branch: I object to that. I mean that I think it at best may be a conclusion of the witness, based upon something or other. It has not appeared at all what he bases it on, or what his reasoning is, or whether he has any proper basis for forming a conclusion. I don't think that a proceeding which goes ahead and asks for that kind of matter which obviously must be a matter of conclusion based upon a good many deductions, and so forth, can be put in as evidence in this way, and I object strenuously to doing it in this way. It does not appear that he has any basis for any such conclusion.

Trial Examiner: Does the Commission's counsel wish to be heard?

Mr. Wahrenbrock: We have shown that the witness has studied the facilities and shown by his answer to this question what his [*1458*] study has shown and propose to show by subsequent questions the details by which the study that he has made demonstrates the conclusion.

Trial Examiner: This is proposed to be made as a statement of fact and not as a conclusion. The witness will be subject to cross examination as to the basis of his determination. The objection is overruled and the witness may answer.

Mr. Branch: I bow to your ruling, but I do suggest it is very unusual procedure for a witness in a matter like this, without indicating what the basis is, the factual basis or the theoretical basis for such a conclusion, to be allowed to state it, because I should say that neither the Examiner or anyone else is yet in a position to see how there is any basis for any such conclusion as this.

Trial Examiner: It may be that in order to be understood, he will have to answer some further questions, either on direct or cross-examination. The witness may proceed.

Mr. Branch: My exception is noted?

Trial Examiner: The exception will be noted.

A I did.

By Mr. Wahrenbrock: *Q* Will you explain? *A* I have stated that the electric energy was supplied to the C. P. 1 and the C. P. 2 lines at the South Meadow Substation from the Falls Village generating plant, and—I am sorry [*1459*] I misspoke myself. I have stated that electric energy was supplied to C. P. 1 and C. P. 2 lines at South Meadow Substation and at the Falls Village generating plant. I found numerous periods of time during which the generation at Falls Village was zero and South Meadow Substation was receiving all its energy from Massachusetts and none from The Hartford Electric Light Company. At the same time no energy was being received from the Central Hudson Gas & Electric Corporation.

By Mr. Wahrenbrock: *Q* Can you cite a particular instance when such a condition existed and explain it? *A* Yes. Such a condition existed on Sunday, January 15th, 1939, during the first nine hours of the day. I have prepared a table showing the energy operations along the C. P. 1 and C. P. 2 lines for those hours. I have also prepared a graphic representation which illustrates the flow of electric energy on the C. P. 1 and C. P. 2 lines under these conditions, which I have called "Flow Diagram A".

Mr. Branch: May it be stipulated that motion goes to this entire line, and I move to strike out that answer on the same ground that I objected?

Trial Examiner: Your motion may be noted, and it is understood.

By Mr. Wahrenbrock: [*1460*] *Q* Will you produce the tables and the diagram to which you have referred?

Trial Examiner: At the present time we are faced with mechanical difficulties and it might be a good time to take a ten minute recess, and we will so be in recess.

(After a short recess, the hearing was resumed.)

[*1461*] Trial Examiner: The hearing will be in order.

Mr. Wahrenbrock: I ask that the table referred to by the witness be marked for identification—

Mr. Branch: May I see it?

Mr. Wahrenbrock: Yes, sir. (Hands document to counsel.) I ask that it be marked as Exhibit No. 61.

Trial Examiner: There seems to be a shortage of copies.

Mr. Wahrenbrock: There is no shortage of copies. I am going to hand two copies to respondent's counsel. I will hand one copy to the Examiner, and ask that the original be marked for identification as Exhibit No. 61.

Trial Examiner: The document will be marked Exhibit No 61 for Identification.

(The document referred to was marked as Exhibit No. 61 for Identification.)

Trial Examiner: Does the original have any marking on the outside?

Mr. Wahrenbrock: No, sir. I hand two copies to respondent's counsel, one to the examiner, and one to the reporter, of the diagrams referred to, and ask that it be marked Exhibit No. 62 for Identification.

Trial Examiner: Mr. Wahrenbrock, for later handling, isn't there some way that we can get a name to put on the outside of this other than the exhibit number, which would be descriptive of its contents?

[*1462*] Mr. Wahrenbrock: I thought it would be best to rely upon the identification as an exhibit, and avoid the confusion.

Trial Examiner: If it is so arranged, it may be advisable to let it stand as it is for the present, at least. I was thinking of later convenience.

Mr. Wahrenbrock: There is a designation on the first sheet of the table, and there is a designation on each sheet of the diagram.

Trial Examiner: The diagram, or the group of diagrams, which are designated from A to K with, I believe, J omitted—

Mr. Wahrenbrock: That is right.

Trial Examiner: Will be marked as Exhibit No. 62 for Identification.

(The document referred to was marked as Exhibit No. 62 for Identification.)

Trial Examiner: Counsel may proceed.

By Mr. Wahrenbrock: *Q* Referring to Exhibit No. 61 for Identification, and to the sheet of that exhibit which is headed, "Sunday, January 15, 1939",—

Trial Examiner: These sheets are not numbered, are they?

Mr. Wahrenbrock: No, sir. They are headed with the designation of the dates, and the dates are in chronological order.

By Mr. Wahrenbrock: [*1463*] *Q* Will you state the sources of information on which the figures on that sheet are based? *A* The figures in the first section of this table, and in the line showing the delivery to Bristol, were obtained from photostatic copies of the log sheets of the Connecticut Valley Exchange. The figures with respect to Falls Village generation and delivery to Central Hudson Gas & Electric Corporation were obtained from photostats of the log sheets of the Connecticut Valley Power Exchange and of The Housatonic division of the Connecticut Power Company. The figures with respect to The Housatonic division load were obtained from the photostats of the log sheets of The Housatonic division. The figures with respect to deliveries at Torrington, deliveries to The Torrington Electric Light Company, were obtained for this day from photostats from the R. A. meter sheets for Torrington. The figures in the third section of the table were obtained from The Connecticut Light and Power Company.

Q Before going further, will you please state whether the corresponding figures on other sheets in Exhibit 61 for Identification were obtained from the same sources except for the figures with respect to deliveries to The Torrington Electric Light Company? [*1464*] *A* These figures on all sheets for the days included in these tables were taken from the sources as indicated, except that the deliveries to The Torrington Electric Light Company were in some cases obtained from the photostats of the

printometer records at Torrington. The printometer records, I believe, apply to 1940 and 1941.

Q What is the source of the figures from which you have obtained the figures in this table? *A* Could I have that question again, please?

Q You have said that these figures were obtained from certain log sheets, and so forth. What do they represent on the log sheets? *A* These figures represent on the log sheets either direct recordings from the meter readings, or calculations made from such meter readings and recorded on the log sheets.

Q Will you explain. *A* There were watt hour meters at South Meadow which showed the cumulative amount of the flow of energy over the Hartford-Agawam line from Massachusetts to South Meadow substation. These meters were read hourly by an employee who recorded the readings on the station log sheet. The flow during any hour over a line is the difference between meter readings at the end of the hour and the meter reading at the end of the preceding hour. The 22,000 kilowatt hours shown as received from Massachusetts during the first hour is the sum [*1465*] of the flow over the two lines as obtained from the meter readings. The meters are ratcheted so that they do not register when the energy flow is in reverse direction, similar meters being provided for the flow of energy from South Meadow to Massachusetts.

Q When you referred to the 22,000 kilowatt hours shown as received from Massachusetts during the first hour, were you referring to the table for Sunday, January 15, 1939 in Exhibit 61 for Identification? *A* Yes. I was referring to that. That was the page at which I was turned.

Q How does a ratcheted meter differ from an ordinary watt-hour meter? *A* If an ordinary watt-hour meter were used on the Hartford-Agawan line at South Meadow substation, the indication on the meter of flow from Massachusetts to South Meadow during some hours would be reduced by reason of the flow of energy from South Meadow to Massachusetts during other hours.

In order to obtain indications of the total flow of energy in each direction, two meters are placed on each line, so arranged by means of mechanical ratchets that one will integrate the flow in one direction, but whose register will not operate when the flow is reversed. The other meter will integrate the energy flow in the direction opposite to that, causing the first to register, and will not register while the first [*1466*] is registering. In the case of the Hartford-Agawan line, one meter integrates the flow from Massachusetts to Connecticut, and the other meter integrates the flow from Connecticut to Massachusetts.

Trial Examiner: Did I understand the witness to say "indicate" or "integrate"?

The Witness: I have used both. I believe I was referring—

Trial Examiner: The last three times you used the word is what I had in mind.

The Witness: Integrate—i-n-t-e-g-r-a-t-e-s.

By Mr. Wahrenbrock: *Q* Were there any other ratcheted meters at the South Meadow substation? *A* A ratchet meter for each direction of flow is provided for each of the three lines connecting The Hartford Electric Light Company to South Meadow substation. Separate ratchet meters for each direction of flow were provided to show the flow of energy between the South Meadow substation and the CP-1 and CP-2 lines. All of these meters were read hourly, and the readings recorded on a station log sheet by an employee.

Q Will you please describe the metering at the other points as shown in the table? *A* The generation at Falls Village was obtained by totaling the information obtained from the hourly readings of the [*1467*] separate meters in each of the three generator circuits at Falls Village. The Housatonic division load was obtained from the hourly readings of the single meter provided for the two circuits supplying the Housatonic division load. The delivery to Central Hudson Gas & Electric Corporation was obtained from the hourly readings of the ratcheted meter provided for this circuit. These readings are recorded on the Falls Village

station log sheets hourly by an employee. The delivery to The Torrington Electric Light Company for this day was obtained from the R.A. demand meter charts as the watt-hour meter at Torrington is not read hourly.

Q Will you explain that? *A* Prior to the year 1938, there was no hourly demand reading available at Torrington. During the years 1938 and 1939, the demand of The Torrington Electric Light Company was recorded by an R.A. demand meter. This meter drew a curve proportional to the amount of energy received during each 15-minute period, the curve starting from zero at the beginning of each 15-minute period. From photostatic copies furnished by The Connecticut Power Company of the charts drawn by this meter, the data shown in the tables were computed. During the year 1940 and during the current year 1941, the demand at Torrington was obtained from a printometer. This meter prints each 15 minutes a number proportional to the kilowatt hours received during those 15 minutes. From the photo- [*1468*] static copies of the record of this printometer furnished by the Connecticut Power Company, the data for Torrington for the days and the years 1940 and 1941, were obtained.

Q With that explanation, will you please continue with your description of the metering at the points shown on the table? *A* The delivery to The Connecticut Light and Power Company at Bristol was obtained from the hourly readings of the single meter provided for the two circuits at Bristol. These hourly readings were recorded in a log sheet at the Bristol substation, and were also telephoned to the Connecticut Valley Power Exchange at Hartford for insertion in the log sheets of the Connecticut Valley Power Exchange. The receipt by The Connecticut Light and Power Company of the electric energy from The Torrington Electric Light Company was obtained from the hourly readings on the ratcheted meters at Torrington, and recorded on station log sheets of The Torrington Company. That data was furnished to the Commission by The Connecticut Light and Power Company in tabulated form. The generation at Robertsville is shown for the

hourly readings of the watt-hour meter of the output of this plant, recorded on log sheets by the operator. This data, too, was supplied to the Commission in tabular form by the Connecticut Light and Power Company.

Q With that description of the bases of information [*1469*] on which the table is based, will you now describe the table? *A* Referring to the table for Sunday, January 15, 1939, you will note that it is divided into four sections. The first section tabulates for selected hours The Connecticut Power Company's energy operation at its 66 k. v. substation at South Meadow. The amounts of energy received at South Meadow substation from Massachusetts over the Hartford-Agawam line are listed on the first line of the table. On the second line of the table, the amounts of energy received by The Connecticut Power Company from The Hartford Electric Light Company at the substation—I should say at the South Meadow substation, are listed. On the third line of the table, the amounts of energy which were delivered by The Connecticut Power Company to The Hartford Electric Light Company at South Meadow are listed. On the fourth line in the table the amounts of energy delivered to the CP-1 and CP-2 lines from the South Meadow substation are listed. For all hours shown on all tables included in this exhibit, no energy was delivered to Massachusetts over the Hartford-Agawam line, and no energy was received at South Meadow from CP-1 and CP-2 lines. The second section of the table tabulates The Connecticut Power Company's operations along the CP-1 and CP-2 lines. On the first line of the table are listed the amounts of [*1470*] energy generated at Falls Village. On the second line of the table are listed the loads in the Housatonic division. On the third line of the table are listed the amounts of energy delivered to Central Hudson Gas & Electric Corporation.

Trial Examiner: Just a moment. Do I understand that by "all hours" you are referring to the entire table, or simply to the nine hours that were referred to a while ago in the question?

The Witness: I don't know how I expressed myself, Mr. Examiner.

Trial Examiner: Read the witness's answer to that question.

(Whereupon the last answer as above recorded, was read by the reporter.)

[*1471*] Trial Examiner: I think the point is clear.

The Witness: Can you tell me where I left off?

(The witness's last remarks were read by the reporter.)

A (Continuing) On the fourth line of the table are listed the deliveries by The Connecticut Power Company to The Torrington Electric Light Company. On the fifth line are listed the deliveries by The Connecticut Power Company to the Connecticut Light and Power Company at Bristol. For all hours shown on all tables in this exhibit no energy was received from the Central Hudson Gas & Electric Corporation.

Mr. Wahrenbrock: Will you let me interrupt a moment? Is that statement clear at that point?

Trial Examiner: I think it is.

Mr. Wahrenbrock: Thank you.

By Mr. Wahrenbrock: *Q* Will you continue? *A* The third section of this table tabulates the energy operations of The Connecticut Light and Power Company in its Winsted District. On the first line of the table are listed the amounts of energy received by the Winsted District from The Torrington Electric Light Company. On the second line of the table are listed the amounts of energy generated at Robertsville; for all hours, shown on all tables in this exhibit, no energy was delivered from Winsted to Torrington. The fourth section of [*1472*] the table shows the applicable flow diagram.

Q And by "Applicable Flow Diagram" you mean it shows the flow diagram in Exhibit 62 for Identification, which is applicable to the hour under which the latter appears? *A* Yes.

Q Will you describe now Flow Diagram A of Exhibit 62 for Identification. *A* Flow Diagram A illustrates the flow condition when energy transmitted from Massachusetts and received at South

Meadow Substation is delivered to the C. P. 1 and C. P. 2 lines, and possibly to the Hartford Electric Light Company during the hours when generation at Falls Village is zero and no energy is received from the Central Hudson Gas & Electric Corporation. On this diagram the Massachusetts energy is shown in red. The blue color is used in this diagram to indicate Connecticut generating plants and energy generated in Connecticut. The arrows indicate the direction of flow. It will be noted that from Massachusetts, the stream of Massachusetts energy is shown reaching South Meadow Substation and then passing into The Hartford Electric Light Company and also into the C. P. 1 and C. P. 2 lines. Under this condition the Massachusetts energy was transmitted to Middletown, and Portland from the Middletown tap on the C. P. lines prior—

[*1473*] Mr. Branch: I think he was just explaining, I think this is not responsive, where he goes further.

Trial Examiner: You mean it is not responsive to the question of counsel?

Mr. Branch: Yes.

Trial Examiner: All right. The witness will restrict himself to answers to the questions.

Mr. Wahrenbrock: Well, may I ask the witness to explain what this diagram represents, with reference to the flow of Massachusetts energy to Middletown and Portland?

Mr. Branch: Well, I object to that on the ground that no proper basis for any such conclusion as the diagram gives in that respect has been laid.

Trial Examiner: I think a rather considerable amount of evidence pointing in that direction, based upon studies, has been presented. The source of the study has been shown and the evidence will be admitted and objection will be noted to the overruling of objection of counsel.

Mr. Branch: May I have a general objection to this line of questions, if they are to continue, without having to interrupt after each question?

Trial Examiner: You may.

The Witness: May I have the question read?

(Question read by the reporter.)

A This diagram indicates that under this condition [*1474*] Massachusetts energy was transmitted to Middletown and Portland from the Middletown tap on the C. P. lines and to the C. L. & P. Company at Portland, prior to July 1, 1939.

By Mr. Wahrenbrock: *Q* Before you continue with your explanation of the diagram, will you explain the part of the diagram which relates to Hartford? What does the blue circle represent? *A* The Hartford Electric Light Company's plant is shown by a blue circle, but the diagram shows that no energy from that plant is under this condition delivered to the C. P. 1 and C. P. 2 lines.

Q Will you explain what the diagram represents, with reference to the further flow of Massachusetts energy to the C. P. 1 and C. P. 2 lines to the west? *A* The diagram shows Massachusetts energy is transmitted to Bristol, to The Connecticut Light and Power Company; Massachusetts energy is transmitted to the Thomaston Division of The Connecticut Light and Power Company and to Torrington. At Torrington part of this energy is used in supplying The Torrington Electric Light Company's own load and part is delivered by The Torrington Electric Light Company to The Connecticut Light and Power Company. The diagram shows The Connecticut Light and Power Company transmits this energy to Winsted for consumption in the service area of Winsted District.

[*1475*] *Q* When you say "the diagram shows", do you mean the diagram is designed to illustrate that type of flow? *A* Exactly. The Robertsville plant is shown as connected to the Winsted District by a blue circle and a blue stream of energy.

Q The blue representing—? *A* Connecticut energy and a Connecticut plant. The broken or dotted arrow alongside this blue stream of energy from Robertsville, indicates that at times under this condition there is no energy delivered from the Robertsville plant.

Q What does the arrow with the broken stem at the right-hand side of the page beside the red line which leads to The Hartford Electric Light Company generating plant indicate? *A* That arrow indicates that under the flow conditions illustrated by flow diagram A, there may be a flow of energy to The Hartford Electric Light Company from the South Meadow substation of The Connecticut Power Company. It is shown in that form as indicated in the legend to indicate that the flow actually may be zero under the conditions illustrated by this diagram.

Q With that explanation, will you continue your explanation of what the diagram is intended to illustrate? *A* I wish to complete my statement about Robertsville. When I stated that at times there is no energy delivered from the Robertsville plant, I wish to add that this is true when the [*1476*] Robertsville plant is not generating. Massachusetts energy is transmitted to Falls Village and to the Housatonic Division. The arrow indicating the flow of energy to Central Hudson Gas & Electric Corporation is dotted because the flow to the Central Hudson Gas & Electric Corporation under this condition may be zero.

Q Will you now explain for some hour shown on the table, which is Exhibit 61 for Identification, how you establish the flow diagram that is applicable to the conditions prevailing during that hour? *A* Referring to the first hour of the day I have previously referred to, January 15th, 1939, I will go through the table step by step, and outline the reasons why Flow Diagram A depicts the energy flow for that hour. I have previously stated that at the South Meadow substation The Connecticut Power Company can receive or deliver electric energy through the connection with The Hartford Electric Light Company, the Hartford-Agawam lines and the C. P. 1 and C. P. 2 lines. During this hour The Connecticut Power Company received at South Meadow substation 22,000 kilowatt hours from Massachusetts. Flow Diagram A which shows Massachusetts energy flowing to South Meadow, corresponds to that condition. No energy was received from The Hartford Electric Light Company during that hour, and 14,000 kilo-

watts were delivered to The Hartford Electric Light Company. Flow [*1477*] Diagram A shows the Massachusetts energy flowing to the Hartford Electric Light Company according to the table. During this hour, 8,000 kilowatt hours were delivered by South Meadow substation to the C. P. 1 and C. P. 2 lines. Since the only energy supplied to the South Meadow substation during this hour was delivered to Massachusetts, the 8,000 kilowatt hours delivered to the C. P. 1 and C. P. 2 lines were Massachusetts energy. Flow Diagram A, which shows Massachusetts energy flowing to the C. P. 1 and C. P. 2 lines, corresponds to this condition. The table further shows that the generation at Falls Village was zero during this hour. Since Falls Village and the South Meadow are the only sources of energy on the C. P. 1 and C. P. 2 lines, and at Falls Village generation was zero, all energy on the C. P. 1 and C. P. 2 lines must have been transmitted from South Meadow. This energy, as I have just shown, was all transmitted from Massachusetts. Flow Diagram A, which shows Massachusetts energy flowing to all points along the C. P. 1 and C. P. 2 lines, therefore, illustrates that condition.

Q Will you discuss each delivery point along the C. P. 1 and C. P. 2 lines, with respect to the flow of energy as shown in the table and illustrated by the diagram? *A* The diagram illustrates Massachusetts energy flowing to the Middletown Division. The table does not make any statement [*1478*] in regard to the amount of energy flowing to Middletown during each hour. Such information was not easily available and is not needed to establish the fact of the flow of energy to Middletown. I have previously shown that the entire supply of electric energy from the Middletown Division was received from the C. P. 1 and C. P. 2 lines. Therefore, during this hour, the Middletown Division received Massachusetts energy which was the only energy which was delivered to the C. P. 1 and C. P. 2 lines. During the hours of the day the East Hampton District—

Q (Interrupting) Will you suspend until some of the racket subsides?

Trial Examiner: The witness may proceed with his answer.

The Witness: Will you read the last sentence?

(The record is read.)

A During the hours of this day the East Hampton District had no other source of supply, excluding the industrial customer which delivered a small amount of electric energy to The Connecticut Light and Power Company during the year. So that it is evident that Massachusetts energy was the only energy received at Middletown Division during the first hour and must have been transmitted to the Connecticut Light and Power Company at Portland. The flow diagram which shows Massachusetts energy flowing [*1479*] to Portland and The Connecticut Light and Power Company at Portland, therefore, illustrates that condition properly.

Q And you are still referring to Flow Diagram A? *A* I am referring to Flow Diagram A. The table shows that during this hour, 2,000 kilowatts of electric energy was delivered to Bristol, that is, to the Connecticut Light and Power Company at Bristol. I have previously shown that the Bristol energy, that is, the energy delivered to Bristol, is supplied from the C. P. 1 and C. P. 2 lines; since the only energy delivered to the C. P. lines during this hour was Massachusetts energy, it is evident that Massachusetts energy was delivered to Bristol. The Flow Diagram shows the flow of Massachusetts energy to Bristol. The table does not make any reference to the hourly delivery of energy to Thomaston. Such data was not easily available and is not necessary to establish the fact of the flow of energy to Thomaston. I have previously shown that the entire supply of electric energy in the Thomaston Division was received from the C. P. 1 and C. P. 2 lines. The only energy delivered to the C. P. 1 and C. P. 2 lines was Massachusetts energy, therefore it is evident that Massachusetts energy was delivered to Thomaston. The Flow Diagram A shows the flow of Massachusetts energy to Thomaston. [*1480*] The table shows that during the first hour of the day, that is, January 15th, 1939, 1,160 kilowatt hours were delivered to The Torrington Electric Light Company. I have previously shown that Torrington is

supplied from the C. P. 1 line. Since only Massachusetts energy was delivered to the C. P. 1 line, it is evident that Massachusetts energy was delivered to Torrington. Flow Diagram A shows the flow of Massachusetts energy to Torrington. The table shows that 800 kilowatt hours were received by the Winsted District from The Torrington Electric Light Company during the first hour. Since, as I have shown, Torrington was receiving Massachusetts energy, it is evident that Winsted also received Massachusetts energy. Since the table shows the generation at Robertsville was zero, it is evident that all the energy used by the Winsted District during the first hour was Massachusetts energy. Flow Diagram A shows the flow of Massachusetts energy to Winsted. Since, as the table shows, the Falls Village plant was not generating, all the energy to the Housatonic Division load amounting to 700 kilowatt hours during the first hour was received from the C. P. 1 and C. P. 2 lines. Since the supply to these lines was Massachusetts energy, [*1481*] it is evident that Massachusetts energy was delivered to the Housatonic Division. Flow Diagram A shows the flow of Massachusetts energy to the Housatonic Division. The table shows that there was no delivery to the Central Hudson Gas & Electric Corporation during the first hour. The diagram indicates by the dotted arrow that the flow to the Central Hudson Gas & Electric Corporation might be zero during the hour. I have gone through the whole Flow Diagram and explained the conditions for the first hour on the table, and showed that the data in the table indicates that the flow was as illustrated by Flow Diagram A.

Q Are there any apparent inaccuracies in the records of meter readings at any point? *A* There are certain apparent inaccuracies which can be explained as being due to the large meter constants. Each of the meters at the South Meadow substation showing the flow over the lines between the South Meadow substation and The Hartford Electric Light Company, the Hartford-Agawam lines and the C. P. 1 and C. P. 2 lines, has a constant of 1,000. That is to say, the smallest unit of measurement is so large as to measure

only roughly small quantities. These meters are read to the nearest division of the dial. In the reading for the first nine hours of January 15th, 1939, there are a total [*1482*] of seven meter readings required to show the figures for the operation of the South Meadow substation. Each of these meters has a constant of 1,000, so that apparent discrepancies between incoming and outgoing energy at the substation is to be expected.

Q Will you explain a little more fully what you mean by a "meter constant"? *A* I mean the amount of energy shown on the meter dial as its smallest unit of measurement.

Q These apparent inaccuracies, to which you have referred, are not due to errors or defects in the meters? *A* No. They are due to the large meter constants. All physical measurements, whether of electric energy or length or volume or area or any other quantity, are subject to the limitations imposed by the smallest unit reading of the instrument used.

Q As a result of the large meter constants, will a meter reading indicate a flow of energy during an hour when, in actual fact, no flow existed? *A* No.

Q Will you explain? *A* The meter may be capable of being read only in such a manner that the reading will indicate a greater or lesser flow during an hour than actually occurred during that hour, but will not show a flow when none took place.

[*1483*] *Q* What is the effect of the large meter constants to which you have referred, on the total of readings, over several consecutive hours? *A* The relative effect becomes less. An individual reading as recorded will not be more than one half of a dial unit higher or lower than the actual amount.

Q In this case do you mean that it wouldn't be more than 500 kilowatt hours, more or less than the actual amount? *A* That is correct. The recorded energy flow over a period of consecutive hours, as obtained from meter readings can differ from the actual flow by not more than one dial unit. Therefore, for several consecutive hours the relative error becomes relatively smaller.

Q Can you therefore state that whenever you have shown in

this table a flow of energy over a line, energy must have flowed over that line during the hour? *A* Yes.

Q Have you covered all of the apparent inaccuracies in the reported meter readings? *A* No.

Q Will you explain the others? *A* You will note that during the first eight hours of January 15th, 1939, the Robertsville plant was not operating. Therefore we know no energy was received from Robertsville, but while there are no figures shown for the receipt of energy [*1484*] from The Torrington Electric Light Company during the second, fourth, fifth and seventh hours, it is evident that the energy used in the Winsted District during those hours must have been supplied from Torrington.

Q Can you explain that? *A* The fact that there appeared to be no receipt of energy for Winsted from either source during those hours can be explained as being due to the relatively large meter constant at Torrington. The Torrington meter at that date had a meter constant of 1,600 and was read to the nearest half division, so that effectively its meter constant was 800, and since the delivery to Winsted is much less than 800 during many hours, the meter readings as recorded at the end of two or more consecutive hours may be the same although in fact energy was continuously delivered to Winsted. I therefore had arrows drawn between figures for delivery to Winsted, to indicate that part of the amount recorded for a particular hour probably actually flowed during the period before and after the hour in which the amount is shown.

Q When you say you have had arrows drawn, are you referring to the tables, and all of the tables in Exhibit 61 for Identification? *A* I am.

Q That is the line which follows the item "Received from The Torrington Electric Light Company"? [*1485*] *A* That is right.

Q Will you continue with your explanation? *A* Specifically the 800 kilowatt hours shown during the first hour undoubtedly includes some energy delivered during the second hour. The 800 kilowatt shown at the third hour probably includes some energy which was delivered during the second, fourth and possibly fifth

hour. The 800 kilowatt hour which is shown at the sixth hour possibly includes some energy delivered during the fifth, seventh and possibly the fourth hour. The fact that 800 kilowatt hours is recorded in the log sheet during a particular hour merely establishes that the points on the meter dial advanced enough during that hour, because of a flow of energy during that hour, to cause the operator to read it as registering nearer the next effective unit, at the end of the hour.

[*1486*] *Q* What can you say as to the accuracy with which meter readings are taken and the records made on log sheets? *A* Ordinarily, the meter readings are taken carefully and scrupulously recorded on the log sheets. The company depends on meter readings and log sheets in its transactions with other companies, for its information on generation receipts and deliveries of energy, for its load data, for information as to its future needs, and for many other purposes. The taking of meter readings and the preparation of log sheets involve expenses that would not be justified if the data were not reliable. I would say that meter readings and log sheets can be relied on in general for accuracy.

Q What account have you taken of losses on the lines and in the substation? *A* The losses on the lines and in the substations need not be considered with respect to flow diagram A, as they could not change the type of flow during the hours when flow diagram A applies.

Q Can you identify any other instances during which Falls Village generation was zero and energy from Massachusetts only was supplying loads served by CP-1 and CP-2 lines from Hartford to Falls Village, during the period covered by your study?

Mr. Branch: May I have that question read? I didn't follow it.

[*1487*] Trial Examiner: The question will be read for the benefit of counsel.

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: In addition to the table for January 15, 1939, I have prepared tables for twenty other days. On eight of these

days, the energy flow conformed to Flow Diagram A, for two or more consecutive hours. The days are as follows: May 12, 1937, June 1, 1937, May 30, 1938, November 26, 1938, January 15,—

Mr. Branch: Just a minute, while I take those down. Can you give the days of the week?

The Witness: I haven't got them handy. They are shown on each one of the tables, so that when you turn to the tables you know the day of the week immediately.

Mr. Branch: The last date I have is November 26, 1938.

The Witness: January 15, 1939, May 22, 1939, May 29, 1939, June 1, 1939.

Trial Examiner: The witness may well keep in mind the fact that attorneys as a rule are not stenographers, and also it is rather difficult for them to take anything like that down when it is said rapidly.

Mr. Branch: I think I got it. Your statement as to me is entirely correct.

By Mr. Wahrenbrock: [*1488*] *Q* Mr. Miller, were there any periods of time other than those represented by Flow Diagram A, in which only Massachusetts energy was supplying requirements of the loads supplied by the CP-1 and CP-2 lines from Hartford to Falls Village? *A* Yes.

Q Have you prepared a diagram illustrating such flow? *A* Yes. Flow Diagram C and Flow Diagram I. Flow Diagram C and Flow Diagram I are contained in the exhibit of which Flow Diagram A is a part.

Q Will you explain the type of flow illustrated by Flow Diagram C? *A* Flow Diagram C illustrates the flow condition when energy transmitted from Massachusetts and received at South Meadow substation is transmitted to CP-1 and CP-2 lines, and none is received at South Meadow from the Hartford Electric Light Company. And during the same hour, the generation of Falls Village was less than the combined deliveries to the Housatonic division and the Central Hudson Gas and Electric Corporation. This diagram is the same as Flow Diagram A from Massa-

chusetts, that is, from the right-hand side of the diagram leftwards, up to but not including Falls Village. As indicated in Flow Diagram A, Massachusetts energy is transmitted to Middletown and Portland, to Bristol, to Tomaston, and Torrington. From Torrington, Massachusetts energy is [*1489*] transmitted by The Connecticut Light and Power Company to Winsted for its service area there. It will be noted that under this condition the Housatonic division is entirely supplied with energy generated in the Falls Village plant, and that Central Hudson Gas & Electric Corporation—

Mr. Branch: Excuse me. Are you speaking of C or I, or both?

The Witness: C.

A (Continuing) And that Central Hudson Gas & Electric Corporation receives both energy generated at Falls Village and Massachusetts energy from South Meadow.

By Mr. Wahrenbrock: *Q* Will you now illustrate by reference to a particular hour of some day, the energy conditions which are illustrated by Flow Diagram C? *A* Referring to the table for Sunday, May 7, 1939—

Q How many pages following the last one that you referred to is that? *A* I believe it is the second or third sheet.

Mr. Branch: Are these all Sundays?

Mr. Wahrenbrock: The day of the week appears at the top of the page.

Mr. Branch: Yes. All that I have seen were.

Mr. Wahrenbrock: I will be glad to explain that point a little later. I can't get everything in at once. Are you ready that the witness should continue?

[*1490*] Mr. Branch: Yes.

The Witness: Referring to table for Sunday May 7, 1939, you will note that for the hour ending 4:00 A.M., 21,000 kilowatt hours are recorded as being received from the Connecticut Power Company South Meadow—were being received at the Connecticut Power South Meadow substation from Massachusetts, over the Hartford-Agawam lines. No energy was received from the Hart-

ford Electric Light Company. 2,000 kilowatt hours were delivered to the Hartford Electric Light Company. 18,000 kilowatt hours were delivered to the CP-1 and CP-2 lines. Flow Diagram C illustrates this condition by showing Massachusetts energy delivered to South Meadow, and from South Meadow to The Hartford Electric Light Company, and to the CP-1 and CP-2 lines. The table further shows for the hour ending 4:00 A.M., that 5,300 kilowatt hours were generated at Falls Village, as compared to 600 kilowatt hours used in the Housatonic division, and 16,000 kilowatt hours delivered to Central Hudson Gas & Electric Corporation. It is apparent that the Falls Village generation was insufficient to take care of the Housatonic division load, and the delivery to Central Hudson Gas & Electric Corporation, and because of this, that energy from South Meadow substation was delivered to Central Hudson Gas & Electric Corporation. Under these conditions, it is evident that all points between [*1491*] the delivery to Central Hudson Gas & Electric Corporation and South Meadow must have been supplied with energy received from the South Meadow substation. As I have just stated, the energy received from South Meadow substation was Massachusetts energy, and it is evident that all points along the CP-1 and CP-2 lines were served with Massachusetts energy. The table further shows delivery of energy to Winsted from The Torrington Electric Light Company, and that the generation at Robertsville was zero. It is therefore evident that Winsted made use of only Massachusetts energy during the hour ending 4:00 A.M.

By Mr. Wahrenbrock: *Q* May I interrupt to ask whether in referring to the table in your testimony which you have just given, you are referring to the table for Sunday, May 7, 1939, which is a part of Exhibit No. 61 for Identification? *A* That is correct.

Q Will you continue with your explanation. *A* The explanation I made in connection with Flow Diagram A would apply to all other points on the line, and it would be needless repetition to detail them. Flow Diagram C correctly illustrates the fact that

Massachusetts energy is supplied to all points along CP-1 and CP-2 lines under such conditions.

Q How many instances have you tabulated in Exhibit [*1492*] No. 61 for Identification in which the flow of energy was as illustrated by Diagram C, for two or more successive hours? *A* During nine of the twenty-one days selected for tabulation, the energy conditions were as shown by Flow Diagram C for two or more consecutive hours. The days are as follows: May 2, 1937, June 1, 1937, July 5, 1937, August 1, 1938, April 30, 1939, May 7, 1939, April 15, 1940, May 29, 1940, May 30, 1940.

Q Mr. Miller, in all instances, are the applicable flow diagrams shown for each hour on the tables which are Exhibit 61 for Identification? *A* The applicable flow diagram is shown in the table for all hours in those tables.

Trial Examiner: May I interrupt the examination by counsel to ask the purpose of certain marks—I believe they are asterisks, in the column or in the line, rather, marked "Flow Diagram", in various columns of the various pages. I think the witness could explain the purpose of those asterisks.

Mr. Wahrenbrock: They will be explained. If you would like at this time—

Trial Examiner: I would like to have them explained now. It may clarify the point. I believe they have not applied to any particular columns which we have had to do with so far.

Mr. Wahrenbrock: That was our reason for postponing the explanation, Mr. Examiner.

[*1493*] Trial Examiner: All right, we will get the explanation in due time. I wanted to know if there was one.

Mr. Wahrenbrock: There is one. I might say at this point that the first page of Exhibit No. 61 for Identification contains a note on that point which will be explained later.

Trial Examiner: All right. Counsel may proceed with the witness.

By Mr. Wahrenbrock: *Q* Have you tabulated for one of the days for 1941 a flow condition which is illustrated by Flow Dia-

gram C? *A* Yes. During one hour of April 27, 1941, the flow condition was as illustrated by Flow Diagram C.

Q Will you now describe Flow Diagram I to which you have referred?

Trial Examiner: I would suggest that this would be a good time to take a short recess. We will recess for five minutes.

(At this point a short recess was taken, after which the hearing was resumed.)

Trial Examiner: The hearing will be in order.

By Mr. Wahrenbrock. *Q* Will you now describe Flow Diagram I? *A* Flow Diagram I illustrates the flow condition when energy transmitted from Massachusetts and received at South Meadow substation is transmitted to CP-1 and CP-2 lines, and no energy is received at The Hartford Electric Light Company, [*1494*] during hours when the generation at Falls Village was less than the Housatonic division load. This diagram is the same as Flow Diagram A, from Massachusetts, that is, from the right-hand side of the diagram leftwards, up to but not including Falls Village. As in the case of Flow Diagram A, Massachusetts energy is transmitted to Middletown and Portland, to Bristol, Tomaston and Torrington. From Torrington, Massachusetts energy is transmitted by The Connecticut Light and Power Company to Winsted for its service area there. Massachusetts energy may be transmitted to Central Hudson Gas & Electric Corporation. It will be noted that under this condition the Housatonic division is supplied with energy generated in Falls Village, and with energy received from Massachusetts.

Q How many instances have you tabulated when flow conditions are as illustrated in Flow Diagram I of Exhibit No. 62 for Identification? *A* Two, occurring on May 12, 1937, and May 22, 1939. The days tabulated were selected without reference to Flow Diagram I, so that the number of instances tabulated are very few.

Q Were there any periods of time in which only Massachusetts energy was supplying the requirements of some but not all of the

loads supplied by CP lines from Hartford to Falls Village?
[1495] *A* Yes.

Q Have you prepared diagrams illustrating such flow conditions? *A* Yes. Flow diagram E and Flow Diagram G. Flow Diagrams E and G are contained in the exhibit, of which Flow Diagram A is a part.

Q Will you explain Flow Diagram E? *A* Flow Diagram E illustrates the flow conditions when energy transmitted from Massachusetts and received at South Meadow substation is transmitted to CP-1 and CP-2 lines, and simultaneously no energy is being received from The Hartford Electric Light Company, during hours when the generation at Falls Village is less than the combined deliveries to the Housatonic division, to the Central Hudson Gas & Electric Corporation, and to Torrington. This diagram is the same as Flow Diagram A from Massachusetts, that is, from the right-hand side of the diagram leftwards, up to but not including Torrington. As in the case of Flow Diagram A, Massachusetts energy is transmitted to Middletown and Portland, to Bristol and to Tomaston. It will be noted that under this condition, Torrington is supplied with Connecticut energy generated both in Falls Village and in Hartford, and with Massachusetts energy.

[1496] *Q* Excuse me. Did I understand you to say that under the conditions illustrated by Flow Diagram E, Torrington is supplied with Connecticut energy generated at both Falls Village and at Hartford? *A* If I said so, I was mistaken. Under this condition Torrington is supplied with Connecticut energy generated in Falls Village and with Massachusetts energy. Shall I continue?

Q Will you, please? *A* From Torrington, Connecticut energy generated in Falls Village and Massachusetts energy are transmitted by The Connecticut Light and Power Company to Winsted for its service area there. All points to the west of Torrington are supplied with Connecticut energy generated in Falls Village.

Q Will you now illustrate by reference to a particular hour and some day the energy conditions which make Flow Diagram E

applicable. *A* Referring to the table for Monday, May 29th, 1939, and the hour ending 12 P.M. in this table—

Q That is Exhibit No. 61 for identification? *A* That is right.

Q I think we have found it now. *A* Referring to the table for Monday, May—

Mr. Branch: Just a moment.

Mr. Wahrenbrock: When I said "we" I meant to say that all of us have found it.

[*1497*] Trial Examiner: Just a moment, please.

Mr. Wahrenbrock: Have you found it, Mr. Branch?

Mr. Branch: Yes, sir.

By Mr. Wahrenbrock: *Q* Will you continue, Mr. Miller? *A* Referring to the table for Monday, May 29th, 1939, and the hour ending 12 P.M. in that table, you will note that 22,000 kilowatt hours were received at South Meadow substation, Hartford-Agawam lines, from Massachusetts. Flow diagram E, which shows Massachusetts energy flowing to South Meadow substation, corresponds to that condition. No energy was received from the Hartford Electric Company and the table shows the 13,000 kilowatt hours were delivered to The Hartford Electric Light Company. Flow Diagram E accordingly shows Massachusetts energy flowing to the Hartford Electric Light Company. During this hour 8,000 kilowatt-hours were delivered by South Meadow substation to C.P. 1 and C.P. 2 lines. Since the only energy supplied to South Meadow substation during this hour was delivered from Massachusetts, the 8,000 kilowatt-hours delivered to C. P. 1 and C. P. 2 lines were Massachusetts energy. Flow Diagram E, which shows the Massachusetts energy flowing to C. P. 1 and C. P. 2 lines, corresponds to this condition. [*1498*] The table further shows that the Falls Village generation was 1,000 kilowatt-hours. The delivery to the Housatonic Division was 800 kilowatt hours. There was no delivery to Central Hudson Gas & Electric Corporation, and the delivery to The Torrington Electric Light Company was 1,810 kilowatt hours. It is therefore evident that the Falls Village generation was not sufficient to supply the Housatonic

Division load, and the entire delivery to The Torrington Electric Light Company. Part of the energy delivered to Torrington must have been energy delivered to the C. P. 1 and C. P. 2 lines at South Meadow substation. It is also evident that the energy supplied to all points between Torrington and South Meadow substation must have been delivered to C. P. 1 and C. P. 2 lines at South Meadow substation; since the only energy delivered to the C. P. 1 and C. P. 2 lines at South Meadow substation was that transmitted from Massachusetts, Massachusetts energy alone was delivered to all the points from South Meadow substation up to but not including Torrington. During the hours of this day the East Hampton District had no other source of supply excluding the small industrial source, so it is evident that Massachusetts energy, the only energy received at the Middletown Division during this hour, [*1499*] must have been transmitted to The Connecticut Light and Power Company at Portland.

Q May I interrupt to ask what "hours" you refer to by the "hours of this day". *A* I am referring to the hours of Monday, May 29, 1939.

Q Are you referring to all the hours of the day or those shown on the table? *A* These tables are constructed to show energy conditions during certain selected hours, and in all of my explanations I am only referring to the hours of a day which are shown in the table.

Q With that explanation will you continue?

Trial Examiner: I would like to ask one question. The witness has just referred to the matter of the small industrial station. It might be well to find out its relation to the load in that particular district.

The Witness: Mr. Examiner, I have previously in my testimony, in giving the energy purchases and the energy generation in the East Hampton District, stated the amounts of energy purchased by the East Hampton District from this industrial company, the Brownell Company, and I think if you will refer to that you will find that I have covered it.

Trial Examiner: You haven't covered the question I had in

mind, the amount of energy that it might deliver at any given point, the maximum amount that it might deliver during any hour. [*1500*] In other words, the capacity of that station, what it could produce during an hour.

The Witness: I am unable to give you the information as to that station. It is actually a customer of The Connecticut Light and Power Company and operates a small hydro-plant. I attempted to look it up in various publications of the Commission and I was unable to locate that plant. It is apparently quite small. Probably, during its operation, when the plant is operating all of the energy of that plant is used within the plant, in addition to energy purchased from The Connecticut Light and Power Company, and energy delivered to The Connecticut Light and Power Company occurs probably at hours when the plant is not operating, that is, the industrial plant, is not operating.

Trial Examiner: Does counsel propose to put into the record through any witness to be called later, the capacity of this small industrial plant that has been referred to several times, but which the total amount purchased, I believe, is in the record? I understand this is on The Connecticut Light and Power Company's lines, is it not?

The Witness: In the East Hampton District.

Mr. Wahrenbrock: It is a Connecticut Power Company facility and at the moment I am not advised whether that is shown in the reports to the Federal Power Commission or not. If it [*1501*] is so shown, I am sure we can show it. If it is not, we will have to make such inquiry as might elicit it from the witnesses that are under subpoena.

Trial Examiner: Do you expect to call employees of the respondent as witnesses? They might have this information.

Mr. Wahrenbrock: I expect to call employees of the respondent that I think should have that information.

Trial Examiner: All right.

By Mr. Wahrenbrock: *Q* I wish to clarify this matter of the hours during the day, Monday, May 29, 1939, in which you wish

to state, Mr. Miller, the absence of energy other than Massachusetts energy at South Meadow. Directing your attention to the line which shows the receipts from The Hartford Electric Light Company, will you state which hours you intended to refer to? *A* My description referred to the hour ending 12 P.M. on Monday, May 29th, 1939.

Q Was that the only hour that the same situation prevailed? I am not sure that you can answer that offhand. *A* I can answer that question. The flow condition which can be illustrated by flow diagram E occurred during the hour ending 9 P.M. of that same day, Monday, May 29th, 1939.

Q Did it occur during any other hour that day? *A* It also occurred on the hour ending 1 A.M. of that day.

[*1502*] *Q* That calls for a further explanation, but I would like not to go into that at this time. Did it occur during the hour ending 12 P.M.? *A* 12 P.M.?

Q Yes. *A* Yes.

Q It occurred during that hour? During those hours did the East Hampton District have any other source of supply, leaving out of account the small industrial source that you have referred to, during those hours, excluding the industrial source? *A* During those hours, excluding the industrial source, the only source of supply to the East Hampton District was the delivery from the Middletown Division, which in turn gets its energy from the C.P. 1 and C.P. 2 lines.

Q And during those hours what was the source of energy which was delivered to the Middletown Division as shown by the table and the diagram? *A* Energy received from Massachusetts.

Q And that is the condition illustrated by the diagram? *A* I can be specific for those hours, if you want.

Q I wish you would, please. *A* Taking up the hour ending 1:00 A.M.—

Q I suggest that you take up the hour ending 9:00 P.M. *A* All right. The hour ending 9:00 P.M., the table [*1503*] shows 16,000 kilowatt-hours of electric energy received at South Meadow sub-

station from Massachusetts, over the Hartford-Agawam lines. The table further shows that no energy was received from The Hartford Electric Light Company. The table shows 3,000 kilowatt-hours delivered to The Hartford Electric Light Company and the table shows 11,000 kilowatt-hours delivered to the C. P. 1 and C. P. 2 lines. Since the only energy received at South Meadow substation during that hour is the energy received from Massachusetts, the deliveries, both to The Hartford Electric Light Company and to the C. P. 1 and C. P. 2 lines must have been Massachusetts energy.

Q Now, will you continue with your explanation of the applicability of the flow diagram to conditions prevailing? *A* I believe I have stated that—I should say that during the hour ending 12:00 P.M. of this day the East Hampton District had no other source of supply, excluding the small industrial source, so that is evidence that Massachusetts energy, the only energy received at the Middletown Division during this hour, must have been transmitted to The Connecticut Light and Power Company at Portland. Flow Diagram E properly illustrates the flow of Massachusetts energy to Middletown and to the Connecticut Light and Power Company at Portland. The table shows 3,000 kilowatt hours delivered to The Connecticut Light and Power Company at [*1504*] Bristol during the hour ending 12.00 P.M. As was just explained, this energy was transmitted from Massachusetts. Flow Diagram F properly illustrates the flow of Massachusetts energy to Bristol. The flow diagram also properly illustrates the flow of Massachusetts energy to the Thomaston Division. Since the generation at Falls Village exceeded the Housatonic Division load by only 200 kilowatt-hours, it is evident that the greater part of the delivery to Torrington must have been energy transmitted from Massachusetts. Flow Diagram E properly shows the flow of Massachusetts and Connecticut energy to Torrington. The table shows the recorded delivery of 800 kilowatt-hours to Winsted. Since Torrington received both Massachusetts and Connecticut energy, the delivery to Winsted included both Massachusetts and Connecticut energy.

Flow Diagram E properly illustrates the flow of Massachusetts and Connecticut energy to Torrington. The Robertsville plant generated 200 kilowatt-hours for use in the Winsted District. Flow Diagram E also properly shows that there may have been a flow from the Robertsville plant. The delivery to the Housatonic Division was generated in Connecticut and the Flow Diagram E properly illustrates this. As noted previously, the delivery to Central Hudson Gas & [*1505*] Electric Corporation was zero. The broken arrow in the Flow Diagram indicates that the flow to Central Hudson Gas & Electric Corporation may have been zero. The analysis of the data of this table shows that Flow Diagram E properly illustrates the flow conditions during the hour. Under this condition, Torrington was a balance point.

Q What do you mean by "balance point"? *A* Where several loads are distributed along a line which is supplied simultaneously by energy from sources at both ends, the point in the line which marks the division between the points supplied by the sources at one end and the points supplied by the sources at the other end, is called the balance point.

Q What account did you take of losses in the lines and in the substations? *A* I have not calculated or estimated the losses, because figures are not available. Flow Diagram E applies to this hour in the manner I have indicated. The effect of taking losses into account would not have been sufficient to affect my conclusions. At most they would have tended to move the balance point from Torrington to the left.

Q Will you explain your answer, in so far as you say that you have not calculated or estimated the losses, because [*1506*] the figures are not available? To what extent were they not available and what other considerations, if any—or did any other considerations enter into your decision? *A* To have calculated the losses I would have had to know the exact minute to minute flow conditions during an hour. I would have had to know all the characteristics of the lines and of the transformers and other equipment, and it would have involved for each hour a rather large—unduly

large, I should say—amount of computation, which, as I have stated, was unnecessary, because the effect of not calculating those losses only tends to move, as I say, the balance point in this particular case, from Torrington to the left.

Q And would any tendency to move the balance point from Torrington to the left affect the fact that you have stated, that Massachusetts energy was supplied to the Winsted District? *A* No.

Mr. Branch: Just a moment. May we have that question read?

Trial Examiner: The question will be read by the reporter for the benefit of respondent's counsel.

(Question read by the reporter.)

A No. The effect at Torrington and Winsted might have been to indicate that at this particular hour the Connecticut energy—that either no Connecticut energy or a very small amount of Connecticut energy was delivered to Torrington and Winsted, but [1507] it would not in any way affect the fact that during this hour Massachusetts energy was delivered to Torrington and to Winsted.

Q How many instances of flow conditions, corresponding to Flow Diagram E, have you tabulated? *A* Three hours on Monday, May 29th, 1939. The days tabulated were selected without reference to Flow Diagram E, so that the number of instances tabulated is few.

Q Reverting to your preceding answer, if the consideration of losses had shown sufficient losses to actually move the balance point to the left of Torrington, would that have had the effect of making a different flow diagram applicable, to illustrate the flow condition? *A* Yes. If the losses were sufficiently great, so that the 200 kilowatt-hours, by which the generation at Falls Village exceeded the Housatonic Division load were consumed in a line before reaching Torrington, the balance point might have been at either some point between Torrington and Falls Village or the balance point may have been at Falls Village, in which case Flow Diagram I would have applied.

Q Will you now describe Flow Diagram G, to which you have referred? *A* Flow Diagram G illustrates the flow condition and energy generated in Massachusetts and received at the South Meadow Substation is transmitted to C.P. 1 and C.P. 2 lines, [*1508*] and simultaneously no energy is received from The Hartford Electric Light Company during hours when the generation at Falls Village was less than the combined deliveries to the Housatonic Division, the Central Hudson Gas & Electric Corporation, to Torrington and to Bristol. This diagram is the same as Flow Diagram A from Massachusetts. That is from the right-hand side of the diagram, leftward up to but not including Bristol. As in Flow Diagram A, Massachusetts energy is transmitted to Middletown and to Portland, and it will be noted that under this condition Bristol is supplied with Connecticut energy generated at Falls Village and with Massachusetts energy.

Mr. Branch: What are you talking about?

The Witness: Flow Diagram G. All points to the west of Bristol are supplied with Connecticut energy generated at Falls Village.

By Mr. Wahrenbrock: *Q* How does Flow Diagram C—excuse me, I misspoke myself. How does Flow Diagram G, which you have just been discussing, differ from Flow Diagram E which you have previously discussed? *A* Flow Diagram G differs from Flow Diagram E only in the fact that the balance point is at Bristol instead of at Torrington.

Q How many instances have you tabulated flow conditions of [*1509*] the kind illustrated by Flow Diagram G? *A* I have tabulated flows illustrated by the Flow Diagram G on the following days: May 12th, 1937, May 30th, 1938, August 1, 1938, November 26, 1938, May 29, 1939, June 1, 1939 and May 29, 1940. The dates tabulated were selected without reference to Flow Diagram G.

Q Will you explain what you mean when you say the dates tabulated were selected without reference to Flow Diagram G? *A* The criteria used by me in determining which days I wished to

tabulate information for did not include the particular type of flow illustrated by Flow Diagram G. It was after I had received the data and was preparing it that I discovered that I should properly show flow conditions as illustrated by Flow Diagram G and have done so in the table.

[*1510*] *Q* In other words, is it true to say that in selecting the dates which you would set forth in these tables, you did not select the days, in the first place, for the purpose of showing the type of flow which is illustrated by Diagram G? *A* That is correct.

Q You selected the days to illustrate other types of flows, and you found the flows which are illustrated by Flow Diagram G occurring on such days? *A* That is correct.

Q And was that true also with reference to your explanation of the number of days in which flows illustrated by Flow Diagram E were tabulated? *A* I did not select any days to illustrate the flow conditions as shown by Flow Diagram E.

Q In your study, did you ascertain whether there were instances in which the electric energy requirements of all the loads supplied by the Connecticut Power Company lines, from Hartford to Falls Village, were supplied only by electric energy from Massachusetts and from Hartford? *A* I did.

Mr. Branch: May I have that question read?

Trial Examiner: The question will be read for the benefit of counsel.

(Whereupon the last question as above recorded, was read by the reporter.)

[*1511*] By Mr. Wahrenbrock: *Q* Have you illustrated that condition of flow by a diagram? *A* Yes. I have illustrated it by flow Diagram B.

Q Will you describe Flow Diagram B which is a part of Exhibit No. 62 for Identification? *A* Flow Diagram B illustrates the flow conditions when energy generated in Massachusetts and energy generated in The Hartford Electric Light Company system are received at the South Meadow substation and delivered to the CP-1 and CP-2 lines, during hours when the generation at Falls

Village is zero. On this diagram, as in the others, Massachusetts energy is shown in red, and Connecticut generated energy is shown in blue. Massachusetts energy is transmitted from Massachusetts to South Meadow substation. Energy from the Hartford Electric Light Company is also transmitted to South Meadow substation. Both Massachusetts and Connecticut energy are transmitted to CP-1 and CP-2 lines. Massachusetts energy and Connecticut energy are transmitted to Middletown and Portland. Massachusetts Energy and Connecticut Energy are transmitted to Bristol, to The Connecticut Light and Power Company. Massachusetts energy and Connecticut energy are transmitted to Bristol—I am sorry. Massachusetts energy and Connecticut energy are transmitted to the Tomaston division of The Connecti- [*1512*] cut Power Company, and to Torrington; at Torrington, part of the Massachusetts energy and part of the Connecticut energy are used to supply the whole load of The Torrington Electric Light Company. Part of the Connecticut and part of the Massachusetts energy are sold at wholesale to The Connecticut Light and Power Company which transmits the energy to Winsted for consumption in its service area there. The arrow showing the flow from the Robertsville plant is broken to indicate that at times no energy is being delivered from the Robertsville plant. This is true when the Robertsville plant is not generating. Massachusetts energy and Connecticut energy are transmitted to Falls Village and to the Housatonic division. The arrow indicating the Central Hudson Gas & Electric Corporation is broken because the flow under this condition may be zero.

Q Will you now illustrate by reference to a particular hour of some day, the energy conditions to which Flow Diagram B are applicable?

Mr. Branch: May I have the question, please?

Trial Examiner: The question will be read for the benefit of counsel.

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: Referring to the table of Monday, May 29, 1939—

[*1513*] By Mr. Wahrenbrock: *Q* In Exhibit— *A* In Exhibit No. 61, I believe, and the hour ending 1:00 P.M. on this table, you will note that 13,000 kilowatt hours were received at South Meadow substation from Massachusetts. Flow Diagram B properly illustrates flow of Massachusetts energy to South Meadow substation. 2,000 kilowatt hours of electric energy were received at South Meadow substation from The Hartford Electric Light Company, and no energy was delivered to The Hartford Electric Light Company. Flow Diagram B properly illustrates the flow of Hartford energy, or I should say Connecticut energy from Hartford to South Meadow substation. 14,000 kilowatt hours were delivered from South Meadow substation to CP-1 and CP-2 lines. Since the energy delivered to the South Meadow substation was transmitted from Massachusetts and Hartford, the CP-1 and CP-2 lines received Massachusetts and Hartford energy. Flow Diagram B properly illustrates flow of Massachusetts and Connecticut energy to CP-1 and CP-2 lines. The table showed that during this hour, the Falls Village generation was zero. Therefore, as explained previously in connection with Flow Diagram A, all the energy on CP lines was received from South Meadow substation. Since the delivery of energy at South Meadow substation included both Massa- [*1514*] chusetts and Connecticut energy, all points along the CP lines received Massachusetts and Connecticut energy. Flow Diagram B properly illustrates the flow of Massachusetts and Connecticut energy at all points along the CP lines, including Middletown, The Connecticut Light and Power Company at Portland, The Connecticut Light and Power Company at Bristol, the Tomaston division of The Connecticut Power Company, The Torrington Electric Light Company, and the Housatonic division of The Connecticut Power Company. The recorded delivery to Winsted of 800 kilowatt hours from Torrington evidently included both Massachusetts and Connecticut energy, and Flow Diagram B properly shows that.

Q How many instances have you tabulated a flow condition illustrated by Flow Diagram B? *A* I have tabulated instances of flow conditions corresponding to Flow Diagram B as occurring on the following days: May 12, 1937, June 1, 1937, May 13, 1938, November 26, 1938, May 22, 1939, May 29, 1939, June 1, 1939, September 3, 1940, May 26, 1941.

Q Were there any other instances during which the electric energy requirements of all loads supplied by the CP lines from Hartford to Falls Village were supplied only by energy from Massachusetts and from Hartford? *A* There were.

Q Have you flow diagrams illustrating such conditions? [*1515*] *A* Yes. Flow diagrams D and K.

Q Will you now describe Flow Diagram D, of Exhibit No. 62 for Identification? *A* Flow Diagram D illustrates the flow condition when both energy generated in Massachusetts and energy generated in The Hartford Electric Light Company system are received at the South Meadow substation and delivered to CP-1 and CP-2 lines during hours when generation in Falls Village plant was less than the combined deliveries to the Housatonic division and to the Central Hudson Gas & Electric Corporation. This diagram is the same as Flow Diagram B from Massachusetts, that is, from the right-hand side of the diagram leftwards, up to but not including Falls Village. As in the case of Flow Diagram B, Massachusetts and Connecticut energy is transmitted to Middletown and Portland, to Bristol, Tomaston and Torrington, from Torrington, Massachusetts and Connecticut energy is transmitted by The Connecticut Light and Power Company to Winsted for its service area there. It will be noted that under this condition the Housatonic division is entirely supplied with electric energy generated in Falls Village, and that the Central Hudson Gas & Electric Corporation is supplied with Connecticut energy generated in both Falls Village and in Hartford, and with Massachusetts energy.

Q How many instances did you tabulate of the flow con- [*1516*] ditions illustrated by Flow Diagram D? *A* I have tabu-

lated instances of flow conditions corresponding to Flow Diagram D as occurring on four days in the—I will correct that. On five days, in the years 1937, 1939, 1940 and 1941, as foilows: July 5, 1937, May 7, 1939, April 15, 1940, April 26, 1941, and April 27, 1941.

Q Will you describe Flow Diagram K. *A* Flow Diagram K illustrates the flow condition when energy generated in Massachusetts and energy generated in the Hartford Electric Light Company system are received at South Meadow substation and delivered to CP-1 and CP-2 lines during hours when the generation at the Falls Village plant was less than the Housatonic division load. This diagram is the same as Flow Diagram B, from Massachusetts, that is, from the right-hand side of the diagram, leftwards, up to but not including Falls Village. As in the case of Flow Diagram B, Massachusetts and Connecticut energy is transmitted to Middletown and Portland, to Bristol, Tomaston and Torrington. From Torrington, Massachusetts and Connecticut energy is transmitted by The Connecticut Light and Power Company to Winsted for its service area there. Massachusetts and Connecticut energy may be transmitted to the Central Hudson Gas & Electric Corporation. It will be noted that under this condition the Housatonic division is supplied with Connecticut energy generated both in Falls [*1517*] Village and in Hartford, and with Massachusetts energy.

Q What kind of—what have you to say about the energy which is delivered by The Connecticut Light and Power Company, or is transmitted by The Connecticut Light and Power Company to Winsted for its service area there? *A* I think I stated that from Torrington, Massachusetts and Connecticut energy is transmitted by The Connecticut Light and Power Company to Winsted for its service area there.

Q How many instances did you tabulate the flow of electric energy as shown by Diagram K? *A* I have tabulated instances of flow conditions illustrated by Diagram K during the following days in the years 1938 and 1939: May 13, 1938, November 26, 1938, June 1, 1939.

Q Were there any periods of time when only Massachusetts and Hartford energy were supplying the requirements of some, but not all, the loads supplied by the CP lines from Hartford to Falls Village? *A* Yes.

Q Have you a Flow Diagram to illustrate such flows? Have you flow diagrams to illustrate such flows? *A* Yes. Flow Diagrams F and H.

Q Will you describe Flow Diagram F of Exhibit No. 62 for Identification? *A* Flow Diagram F illustrates the flow conditions when energy generated in Massachusetts and energy generated in [*1518*] The Hartford Electric Light Company system are received at the South Meadow substation and delivered to CP-1 and CP-2 lines, during hours when the generation at Falls Village was less than the combined deliveries to the Housatonic division, to the Central Hudson Gas & Electric Corporation, and to Torrington. This diagram is the same as Flow Diagram B from Massachusetts, up to but not including Torrington. As in the case of Flow Diagram B, Massachusetts energy and Connecticut energy are transmitted to Middletown and Portland, to Bristol and to Tomaston. It will be noted that under this condition Torrington is supplied with Connecticut energy generated in both Falls Village and Hartford, and with Massachusetts energy. From Torrington, Connecticut energy generated at Falls Village and in Hartford, and Massachusetts energy, is transmitted by The Connecticut Light and Power Company to Winsted for its service area there. All points on CP-1 and CP-2 lines west of Torrington are supplied with Connecticut energy generated in the Falls Village plant.

Q Where is the balance point under the flow conditions which are illustrated by Flow Diagram B? *A* As in the case of Flow Diagram E, the balance point is at Torrington for conditions illustrated by Flow Diagram F.

Q How many instances did you tabulate of flow conditions illustrated by Flow Diagram F? [*1519*] *A* I have tabulated the following instances of flow conditions illustrated by Flow Diagram

F: January 15, 1939, May 22, 1939, May 29, 1939, September 3, 1940, April 26, 1941, May 26, 1941.

Q Will you now describe Flow Diagram H to which you have referred, of Exhibit No. 62 for Identification. *A* Flow Diagram H illustrates the flow conditions when energy generated in Massachusetts and energy generated in the Hartford Electric Light Company system is received at the South Meadow substation and delivered to the CP-1 and CP-2 lines during hours when the generation at Falls Village was less than the combined deliveries to the Housatonic division, Central Hudson Gas & Electric Corporation, Torrington and Bristol. This diagram is the same as Flow Diagram B, from Massachusetts up to but not including Bristol. As in the case of Flow Diagram B, Massachusetts energy and Connecticut energy is transmitted to Middletown and Portland. It will be noted that under this condition, Bristol is supplied with Connecticut energy generated at the Falls Village and at Hartford, and with Massachusetts energy. All other points west of Bristol are supplied with energy generated at Falls Village.

Q Where was the balance point under the conditions illustrated by Flow Diagram H of Exhibit No. 62 for Identification? *A* At Bristol, as in the case of Flow Diagram G. [*1520*] *Q* How many instances did you tabulate of flow conditions illustrated by Flow Diagram H? *A* I have tabulated instances of flow conditions illustrated by Flow Diagram H during the following twelve days: May 12, 1937, June 1, 1937, May 13, 1938, August 1, 1938, November 26, 1938, January 15, 1939, May 22, 1939, June 1, 1939, April 15, 1940, May 29, 1940, April 26, 1941, April 27, 1941. The days tabulated were selected without reference to conditions represented by Flow Diagram H.

Q Will you state the basis on which you had selected the 21 days which are covered by Exhibit No. 61 for Identification? *A* As I have stated before, the study of the one line diagram of The Connecticut Power Company, disclosed that the two sources of energy in the CP-1 and CP-2 lines—I should say the two main sources of energy in the CP-1 and CP-2 lines were South Meadow

substation and Falls Village. Preliminary examination of the Connecticut Valley Power Exchange log sheets revealed that at times the Falls Village generation was zero, or very small, simultaneously with the receipt of energy at South Meadow substation from Massachusetts. Also Connecticut Valley Power Exchange log sheets revealed that at times the delivery of energy to Central Hudson Gas & Electric Corporation exceeded or was quite close to the generation [*1521*] at Falls Village, simultaneously with the receipt of energy at South Meadow substation from Massachusetts. It became immediately apparent that a selection of days having hours when the generation at Falls Village was zero, or less than the delivery to the Central Hudson Gas & Electric Corporation, simultaneously with the receipt at South Meadow of electric energy from Massachusetts, would enable the establishment of the fact that Massachusetts energy was delivered at times to all points served from the CP-1 and CP-2 lines. Accordingly, lists of such days were prepared from an inspection of the Connecticut Valley Power Exchange log sheets for the period from January 1, 1937 to May 26, 1941.

Q How many days—

Mr. Branch: Excuse me. May I have that last answer read?

(Whereupon the last answer as above recorded, was read by the reporter.)

By Mr. Wahrenbrock: *Q* How many days were so listed by you? *A* 321.

Q During those hours in which electric energy is received at The Connecticut Power Company substation at South Meadow from the Hartford-Agawam line and from the Hartford Electric Light Company, and no electric energy is delivered [*1522*] to any of those, as illustrated by Flow Diagrams B, D, F, H, and K, does the ratio of receipts from Massachusetts to the total of receipts from Massachusetts and Hartford, as can be computed from the table, indicate anything at all about the ratio of electric energy from Massachusetts to electric energy from Hartford and Massachusetts, being supplied The Connecticut Light and Power Com-

pany at Portland, Bristol, and Torrington, as shown by your study?

Mr. Branch: Just a minute, please. Maybe I can get at it this way: Does your question apply merely to the ratio on the particular 21 days that are shown here?

Mr. Wahrenbrock: It doesn't apply to the days.

Trial Examiner: I think it would be better if counsel addressed the Chair.

Mr. Branch: Excuse me, sir. May I ask through you whether the question was directed to ascertaining the ratio of time or days or hours in the 21 days, or what?

Trial Examiner: Can you make a statement for the benefit of counsel?

Mr. Wahrenbrock: Yes, I can clear that readily. It is not a matter of ratio of time a certain type of flow is taking place. It is a question of the ratio of energy from one source to energy from another source, at the same instance.

[*1523*] Mr. Branch: May I inquire what time you have in mind, whether it is merely some of the times shown during these 21 days?

Mr. Wahrenbrock: It is a general question.

Mr. Branch: Well, if it is a general question as to all times, I object, because certainly it hasn't been shown that any study has been made sufficient to make even an estimate as to all times. The witness apparently has confined his studies to a limited number of days, and it doesn't seem to me proper to try to draw any conclusion from that unless a good deal more appears than has appeared here.

Trial Examiner: I think the witness may testify as to ratios during the periods in which he made a study.

By Mr. Wahrenbrock: *Q* In making your answer, will you limit it to the conditions which you studied? *A* Yes. Up to the balance point, if any, on the CP lines the delivery to the loads along those lines will have a ratio of Massachusetts energy close

to that which can be computed from the deliveries to South Meadow substation.

Q Will inaccuracies of readings of meters cause the computed ratio of Massachusetts energy to the total of Massachusetts and Hartford energy to differ from the true value during an hour, and I will ask you again to confine your answer to the conditions prevailing during the period covered by [*1524*] your study? *A* Yes. As I explained previously, a meter reading record may differ from the actual flow during one hour by a maximum of one dial unit. This, of course, will affect the computed ratio of Massachusetts energy. It is evident, of course, that over the course of several hours a high ratio computed during one hour must be balanced by a low ratio computed during another hour. Let me emphasize that the inaccuracy of reading will never operate to show a flow of Massachusetts energy to any load during an hour when in fact no such flow actually took place during that hour.

Q With reference to this table, which is Exhibit 61 for Identification, will you state the number of hours you have tabulated the receipt at Bristol of energy received in whole or in part from Massachusetts?

Q Every hour tabulated in these tables illustrates a flow condition in which some Massachusetts energy is received at Bristol.

Q Can you state the number of instances that you have tabulated in this table, which is Exhibit 61 for Identification, in which some Massachusetts energy was delivered to the Connecticut Light and Power Company at Portland prior to July 1, 1939?

Mr. Wahrenbrock: Would you like to have the question [*1525*] read?

Mr. Branch: Yes.

Trial Examiner: The question will be read for the benefit of respondent's counsel.

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: Every hour tabulated in this table for dates prior to July 1, 1939, illustrates a flow condition in which some Massa-

chusetts energy is delivered to The Connecticut Light and Power Company at Portland.

Trial Examiner: May I at this point ask one question? Will the witness state why there is any particular reason that only certain hours were used? Certain hours appear to be omitted on various days of the study. Is there any particular reason for that, or is it just an arbitrary choice of hours?

Mr. Wahrenbrock: Mr. Examiner, is that addressed to counsel?

Trial Examiner: That is addressed to the witness.

The Witness: There are several reasons for that. In portraying or making up these flow diagrams and putting the hours in the table, I was endeavoring to show the flow of Massachusetts energy to points along CP lines and to The Connecticut Light and Power Company at Winsted, Bristol and East Hampton. During some hours of these days the flow [*1526*] conditions were such that I would not be able to show that, and such hours were of necessity omitted from the table as not being anything I was attempting to show. Also, there are some hours when the information at Torrington regarding the delivery of energy to Winsted was such that I could not in good conscience state that energy was being delivered to Winsted during those hours, and for me to include those hours would have required a complete duplication of all the flow diagrams I have in order to illustrate a condition when energy was not being delivered to Winsted from Torrington during hours when all the other conditions shown by those flow diagrams did apply.

Trial Examiner: Then you have only picked out the hours in which one or other of the flow diagrams from A to K inclusive, which appear in Exhibit 62, and you have used those hours in the preparation of Exhibit 61?

The Witness: Exactly.

Trial Examiner: I think that clarifies that point.

Mr. Wahrenbrock: I was just going to go into the question of how these were selected. You have anticipated some of the questions I was going to ask.

By Mr. Wahrenbrock: *Q* How did you select the 21 days covered by the data in Exhibit 61 for Identification from the 321 days which you have just referred to in your testimony? [*1527*] *A* From those 321 days, 34 days were selected showing such flows for two or more consecutive hours.

Q What do you mean "such flows"? It has been some time since you were interrupted. *A* I stated that the basis of selection was days showing hours during which energy was being received from Massachusetts at South Meadow substation and the Falls Village generation was either zero or less than the Housatonic division load and the delivery to the Central Hudson Gas & Electric Corporation.

Mr. Wahrenbrock: May I have the witness's answer to the preceding question read, please?

(Whereupon the last answer as above recorded, was read by the reporter.)

Trial Examiner: I don't believe that so far the answer is responsive.

Mr. Wahrenbrock: It is partly responsive. It doesn't exhaust the subject, Mr. Examiner. I will bring that out by a couple of further questions.

By Mr. Wahrenbrock: *Q* There were instances in which such flows occurred for considerably more than two consecutive hours? *A* Yes. On one instance such a flow continued for 45 consecutive hours.

Q Did the 34 days to which you have referred—

[*1528*] Mr. Branch: May I have the last answer?

Trial Examiner: The answer will be read by the reporter for the benefit of respondent's counsel.

(Whereupon the last answer as above recorded, was read by the reporter.)

By Mr. Wahrenbrock: *Q* Did the 34 days to which you have referred include all of the days on which such flow conditions persisted for two or more consecutive hours? *A* No.

Q How many days were there on which such flow conditions occurred for two or more consecutive hours? *A* 215.

Q How were those 34 days selected from the 215? *A* I selected them in order to illustrate such flow conditions for two or more consecutive hours occurring during different times of the day, varying durations of time, during different days of the week, during different months of the year and under varying load conditions.

Q How did you select the 21 days shown by your study from those 34 days? *A* In order that the final selection of days should illustrate flows of Massachusetts energy to all CL & P Company districts, which are supplied from the CP-1 and CP-2 lines, I selected those days from the 34 on which there was flow of [*1529*] Massachusetts energy both to the Winsted district of The Connecticut Light and Power Company and to Bristol and for further dates prior to July 1, 1939 to Middletown and Portland.

Q Does Exhibit 61 for Identification, to which you have referred in your testimony, correctly and accurately reflect the facts recorded in the log sheets, meter records and other data which you have described as the basis of your studies?

Mr. Branch: I assume, sir, that the question means for the particular times to which those things relate.

Trial Examiner: I think that can be understood in the asking of the question.

Mr. Wahrenbrock: Yes.

The Witness: It does.

By Mr. Wahrenbrock: *Q* In your study, did you discover any facts which would in any way indicate or suggest that the flows of electric energy from Massachusetts sources, to which you have testified, were accidental? *A* No.

Q That they were abnormal? *A* No. Permit me to state that the period of September 21, 1938 to October 2, 1938, was completely omitted from any consideration by me as being an emergency situation due to the hurricane disaster. None of the facts

to which I [*1530*] have testified refer to operations during this period.

Q In your study did you discover any facts which in any way indicate or suggest to you that the flows of electric energy from Massachusetts sources, to which you have testified, were extraordinary? *A* No.

Q Or that they were brought about unwittingly upon the part of any of the companies involved? *A* No.

Q Or that they were brought about in disregard or violation of established modes of operations or instructions? *A* No.

Mr. Branch: Well, I object to that. I don't think that he has shown that he had any basis on which to have sufficient information to answer that question. I don't think that the witness has been shown to be as yet informed as to the methods of operation or instruction.

* * * * * * [*1533*]

Trial Examiner: The Trial Examiner now rules that the portions of the stipulation offered by Mr. Wahrenbrock on July 9th, with the exception of the second sentence of paragraph 42, [*1534*] and with the exception of the second paragraph of Number 30, the offer of which was withdrawn by Commission counsel at the close of the original objection, will be received in evidence and an exception noted for the respondent.

* * * * * * [*1543*]

By Mr. Wahrenbrock: *Q* Mr. Miller, before continuing with the line of inquiry I was pursuing at the conclusion of the last session, I wish to refer you to the descriptions you have given of the several flow conditions which are illustrated by the respective flow diagrams in Exhibit 62 for Identification, and ask you to summarize, and if you desire, amplify your description of the flow diagrams. *A* Flow Diagrams A, C, E, G and I illustrate flow conditions—

Mr. Branch: Give me those numbers again.

A Flow Diagrams A, C, E, G and I illustrate flow conditions

when the C. P. lines received Massachusetts energy alone from the South Meadow substation. Flow Diagrams B, D, F, H and K, illustrate flow conditions on the C. P. lines when they received both Massachusetts and Connecticut energy from South Meadow Substation.

Mr. Wahrenbrock: May I interrupt? Pardon the interruption.

A The flow diagrams may be further classified as follows: Flow Diagrams A and B illustrate the flow conditions when the generation at Falls Village was zero. Flow Diagrams I—

Mr. Branch: Will you go slowly over this? I would like to take it down.

A (Continuing) Flow diagrams I and K—

[*1544*] Mr. Branch: A and B do what?

The Witness: Flow Diagrams A and B illustrate flow conditions when the generation at Falls Village was zero. Flow Diagrams I and K illustrate flow conditions when the generation at Falls Village was greater than zero but less than the Housatonic Division load. Flow Diagrams C and D illustrate flow conditions when the generation at Falls Village was greater than the Housatonic Division load but less than the combined deliveries to the Housatonic Division load and to Central Hudson Gas & Electric Corporation. Flow Diagrams E and F illustrate flow conditions when the generation at Falls Village was greater than the combined deliveries to the Housatonic Division load and to Central Hudson Gas & Electric Corporation but less than the combined deliveries to the Housatonic Division load, Central Hudson Gas & Electric Corporation and to Torrington. Flow Diagrams G and H illustrate the flow conditions when the generation at Falls Village was greater than the combined deliveries to the Housatonic Division, Central Hudson Gas & Electric Corporation and Torrington, but less than the combined deliveries to the Housatonic Division, Central Hudson Gas & Electric Corporation, Torrington and Bristol.

By Mr. Wahrenbrock: *Q* Have you any explanation to make of the relation of [*1545*] the Thomaston load to the summary of flow

conditions which you have just made? *A* The load in the Thomaston Division is small as compared to the loads to Bristol or Torrington, and I have not, in setting up the flow diagrams G and H, taken into account the matter of the Thomaston load; the effect of taking the Thomaston load into account might have led—I don't know if it would have occurred in any of the hours I have selected—but it might have resulted that in certain cases certain hours now illustrated by flow diagrams G and H might have been illustrated by flow diagrams E and F respectively.

Q In any case would—

Mr. Branch: May I have that last answer read?

Trial Examiner: The reporter will read the answer for the benefit of counsel.

(Answer read by reporter.)

Mr. Branch: Thank you.

The Witness: May I correct my statement I have just made? I think I made an error in my statement.

By Mr. Wahrenbrock: *Q* Would you like to have it read back to you? *A* Yes. Would you read that again? I think I have made a misstatement there.

Trial Examiner: The reporter will read back the witness's answer to him.

[*1546*] (The record is read.)

The Witness: I must correct that statement. It is not entirely right there. The only effect of taking into account the Thomaston load is that it would not have caused a change in the type of flow diagram from G and H to E and F. It might have resulted in showing, in the case of Flow Diagram G that the delivery to Bristol instead of being composed of energy from Falls Village and energy from Massachusetts to have been energy solely from Massachusetts, and in the case of Flow Diagram H, instead of showing a flow of Connecticut energy generated both in Falls Village and in Hartford and Massachusetts energy, it might have resulted in a showing that Bristol received Connecticut energy generated in Hartford, and Massachusetts energy.

By Mr. Wahrenbrock: *Q* Returning now to the line of inquiry we were pursuing at the conclusion of yesterday's session, I would like to ask you further whether in your study you discovered any facts which would in any way indicate or suggest that the flows of electric energy from Massachusetts sources, to which you have testified, were due to any negligence of any employee of any of the companies involved? *A* No.

Q Did any of the log sheets or other records of the company which you inspected contain any notation indicating [*1547*] that any of the flows of electric energy from Massachusetts sources to which you have testified, were due to a violation by any employee of any of the companies of any instructions issued to him or governing his actions?

Mr. Branch: I object because it does not appear that the witness knows, and I should think it would be almost impossible that he would know what the instructions to employees over a long period of time, which probably varied from time to time, were.

Mr. Wahrenbrock: That is not involved in the question, if the Examiner please. It is merely a question of whether the data he has examined, including the log sheets, show that any of the conditions on which these flows were based, arose out of any violation of orders or instructions.

Trial Examiner: I think he can answer as to what the log sheets show. He has examined those. However, I may say this: I think you are entitled to know what log sheets and of what companies you are talking about.

Mr. Wahrenbrock: He has described the data that he has examined with considerable particularity, Mr. Examiner.

Trial Examiner: You referred to this other company, and I didn't know whether there was one or more companies referred to.

Mr. Wahrenbrock: I would be glad to limit the questions to those log sheets and data which he has examined, as described in [*1548*] his testimony.

Mr. Branch: I object to the question for the reasons specified.

Trial Examiner: I think you might separately ask the different

questions. I can't follow the objection of counsel, however. It seems to me this description of the log sheets was made in yesterday's hearings, and I think it will refresh the memories of all if the witness will state which company's log sheets he is talking about.

Mr. Branch: Excuse me. I didn't quite understand what you said about my objection, sir.

Trial Examiner: I said that I could not see the merit of it and am obliged to overrule your objection.

Mr. Branch: All right.

Trial Examiner: Exception will be noted.

Mr. Branch: I understand your statement, though I do not wish to be understood as agreeing with you.

Trial Examiner: All right.

[1549] By Mr. Wahrenbrock: *Q* In making your answer, will you refer to the data specifically? *A* As I have stated previously, I made use of the Connecticut Valley Power Exchange log sheets. I did not observe on any of those log sheets any notations indicating that operations were due by reason of a violation of any rules by any employees of the companies involved in the Exchange. I did not observe on the Housatonic division log sheets any remarks or notes indicating that such a violation of rules by an employee had occurred. The information as to the delivery of energy from Torrington to Winsted and a generation at Robertsville was supplied to the Commission by The Connecticut Light and Power Company, and no notation was supplied with that information indicating any violation of any rules of operation by any employee. The Torrington R. A. charts and the Torrington printometer did not indicate—did not have any notation indicating any violation of such rules, except that for one month, the R. A. charts of The Connecticut Power Company, showing the delivery of energy demand at Torrington, had been misplaced twelve hours in setting it up. The charts they had set up showed twelve hours incorrectly, and a notation was placed by The Connecticut Power Company informing us that the charts were set up twelve hours wrong, and indicating the proper way to read those charts.

[*1550*] *Q* That last error, when corrected didn't affect the validity of any of the conclusions that you have read? *A* It did not affect any conclusions because the proper use of the charts as indicated by the note precluded that.

Q May I ask if you have photostatic copies of the Falls Village log sheets that you can show me? *A* I believe they are on counsel's desk.

Q Do the log sheets of the Falls Village plant of The Connecticut Power Company contain a space for each hour in which you have found notations of irregular conditions? *A* I would not say that the Housatonic log sheets contain the space specifically reserved for each hour. They have a space running the length—from the top to the bottom of the log sheet, in which the operator and other employees at Falls Village apparently place all notes regarding operations of the Housatonic division, and indicating the connections of the various loads on the CP lines, and that space is ample to provide all the information on operations, and on some days that space is completely filled with notes showing that every irregularity of operation that might occur would have been stated there, because every time a switch is operated, it is noted in that column. So that, they have a complete story as to the switching operations along the CP lines and at Falls Village.

[*1551*] *Q* In your study, did you attempt to discover any facts to indicate that the operating personnel of The Connecticut Power Company or The Connecticut Light and Power Company knew that the Connecticut loads were being supplied by Massachusetts sources of energy?

Mr. Branch: I object as to what The Connecticut Power employees knew, or any indication of what anybody else knew, unless the authority and source of information respecting The Connecticut Power Company is shown.

Mr. Wahrenbrock: I will modify the question to confine it to employees of The Connecticut Light and Power Company.

Mr. Branch: I think you have to have something more definite than that.

Trial Examiner: Will you read the question back?

(Whereupon the last question as above recorded, was read by the reporter.)

Trial Examiner: Is this a part of a series of questions to develop something, or is it to stand alone?

Mr. Wahrenbrock: I have one or two further questions on the same subject.

Trial Examiner: Well, this doesn't appear very material. It may be relevant, and the objection will be overruled and the answer permitted.

By Mr. Wahrenbrock: *Q* Will you limit your answer to the operating per- [*1552*] sonnel of The Connecticut Light and Power Company, please. *A* Will you read the question again, please.

(Whereupon the last question as above recorded was again read by the reporter.)

Trial Examiner: You understand, Mr. Miller, that you will answer only as to The Connecticut Light and Power Company?

The Witness: Yes, sir. No, except as the facts which my study elucidated, must undoubtedly have been known by the operating personnel, and the conclusions to be drawn from them must have been understood by them.

Mr. Branch: I move that the responsive part of the answer, "No", stand, and that the rest be stricken.

Trial Examiner: It will be so ordered.

* * * * * * [*1556*]

Mr. Wahrenbrock: *Q* From what source has the Borough of Groton received its electric energy supply during the period covered by your study? *A* The Borough of Groton has purchased all its electric energy requirements from The Connecticut Light and Power Company which owns and operates a transmission line from its Montville plant to the Borough of Groton.

Q Will you state the amount of purchases made by the Borough of Groton from The Connecticut Light and Power Company during the years covered by your study? *A* The Borough of Groton purchased 3,684,203 kilowatt hours in the year 1935. 4,233,520 kilowatt hours in the year 1936.

Trial Examiner: Was that 524?

The Witness: 520.

4,300,560 kilowatt hours in the year 1937.

4,664,380 kilowatt hours in the year 1938.

5,554,744 kilowatt hours in the year 1939.

And 6,234,240 kilowatt hours in the year 1940.

* * * * * * [*1557*]

By Mr. Wahrenbrock: *Q* At what point or points was the energy supplied by The Connecticut Light and Power Company to the Borough of Groton delivered from August 26, 1935, to February 28, 1941.

* * * * * * [*1559*]

A The energy sold by The Connecticut Light and Power Company to the Borough of Groton was delivered at the Trails Corner substation in Groton and at the Groton-Long Point high voltage substation in Groton-Long Point.

Mr. Branch: May I have that answer read?

Trial Examiner: The reporter will read the answer for the benefit of respondent's counsel.

(The answer is read by the reporter.)

By Mr. Wahrenbrock: *Q* What did the data which you have studied and described in your testimony show about the point of generation of that energy? *A* I did not make any attempt to determine the source [*1560*] of the energy delivered to the Borough of Groton, but it would appear from the map of The Connecticut Light and Power Company that all or the greater part of the energy delivered to Groton was generated at The Connecticut Light and Power Company's 50,000 k. v. steam electric plant at Montville, in Connecticut.

Q Was all the electric energy purchased by the Borough of of Groton consumed at points in the State of Connecticut? *A* No. The Borough of Groton sold part of the electric energy which it purchased from the Connecticut Light and Power Company to

Fishers Island Farms, Incorporated, and its successor, Fishers Island Electric Corporation, for resale. During the period commencing prior to the passage of the Federal Power Act up to approximately February 8th or 9th, 1941, when such sales were discontinued.

Q Will you state the amounts of purchases of electric energy by Fishers Island Farms, Incorporated, from the Borough of Groton during the period of your study? *A* Fishers Island Farms, Incorporated purchased from the Borough of Groton 1,280,700 kilowatt-hours in the year 1935, 1,348,200 kilowatt-hours in the year 1936, 1,409,150 kilowatt-hours in the year 1938, 1,435,600 kilowatt-hours in the year 1939 and up to November 17, 1940, 1,396,800 kilowatt-hours in the year 1940.

[*1561*] *Q* What was the source—

Mr. Branch: May we have the 1939 figure?

The Witness: 1,435,600.

By Mr. Wahrenbrock: *Q* What was the source of those figures? I mean to say where did you obtain that data? *A* The figures for 1940 and 1938 were obtained from Form 64-A, filed by Fishers Island Farms. The figures for the year 1939 were obtained from the records of the Borough of Groton in the course of a field trip that I made. I believe the figures for 1935 and '36 were obtained at the same time.

Q Have you figures for the year 1937? *A* No, I did not request those figures and the Fishers Island farms did not file a report for the year 1937. Neither did the Borough of Groton in its report to the Commission, state the amount of its sales to Fishers Island Farms.

Q Have you any figures on the purchases by the Fishers Island Electric Corporation since November 17th, 1940? *A* No, I was not able to locate a report or a power system statement for the Fishers Island Electric Corporation for the balance of 1940, and the report for 1941, of course, is not due as yet.

Q In your discussion of the three two-winding power trans-

formers at South Meadow substation of The Connecticut Power Company, I believe you stated the capacity of those transformers. [*1562*] Will you explain under what conditions of rating you stated the capacity of those transformers? *A* Under the condition of forced-cooling. The rating of one transformer is 19,200 k. v. under forced cooling, and 12,000 k. v. a. without forced cooling. The ratings of the other two transformers are each 12,000 k. v. a. under forced cooling and 7,500 k. v. a. without forced cooling.

Trial Examiner: Did I understand you to say "forced cooling"?

The Witness: Yes.

By Mr. Wahrenbrock: *Q* Will you explain briefly for the benefit of your lay audience what forced cooling is? *A* It is simpler to start first without forced cooling in the explanation. The transformers are connected up and used without any attempt to take the heat developed in the transformers, other than natural convection currents that may exist and radiation from the transformers. Under those conditions the transformers will have a certain rating. Now, if some means is provided for removing heat faster than would be possible under conditions where no attempt was made to cool the transformers, the transformers are capable of operating under considerably heavier loads, without excessive heat causing damage to the transformers.

[*1563*] Mr. Wahrenbrock: Thank you.

By Mr. Wahrenbrock: *Q* In your testimony yesterday you referred briefly to an instance of a flow of Massachusetts energy to all points on the C.P. 1 and C.P. 2 lines for forty-five consecutive hours. Will you state the dates on which the flow that you referred to occurred? *A* On July 4th and July 5th, 1937. The deliveries to Central Hudson Gas & Electric Corporation exceeded the Falls Village generation during each hour of the twenty-four hours of July 4th, 1937 and during each hour of the next twenty-one hours of July 5th, 1937, finishing with the hour ending 9 P.M. on July 5th, 1937.

Q During those forty-five hours, were all the loads supplied by the C.P. 1 and C.P. 2 lines supplied exclusively by Massachusetts energy?

Mr. Branch: I have an objection that goes to this general line of testimony, which I think I made before, and of course it applies to this question and similar questions.

Trial Examiner: The objection is overruled. It seems to me this is obviously relevant.

Mr. Branch: I wasn't attempting to reargue it, sir, I merely wanted it to be understood that my objection goes to each of these questions, so I won't have to interrupt on each one of them.

[*1564*] Trial Examiner: It will be understood that the objection goes to the entire line of questions. I believe the witness has a question before him.

Mr. Wahrenbrock: I wish to rephrase that question, if I may.

By Mr. Wahrenbrock: *Q* I ask you whether during that 45 hours all of the electric energy delivered by The Connecticut Power Company from its C.P. 1 and C.P. 2 lines consisted exclusively of Massachusetts energy. *A* No, I believe there were one of two hours, or possibly three hours, in those 45 hours, when the energy delivered to the C.P. lines and to the loads on the C.P. lines included some Hartford energy, in addition to Massachusetts energy, but in each of those cases where there was some Hartford energy, the Massachusetts energy was much the larger.

Q In making that answer, are you relying on your recollection or do you have the data available from which you can refresh your recollection? *A* I am at the present moment relying on my recollection, but on the counsel table there is a group of photostats of Connecticut Valley Power Exchange log sheets.

Q Can you refresh your recollection by referring to the log sheets?

* * * * * * [*1566*]

By Mr. Wahrenbrock: *Q* I show the photostats to the witness to enable him to refresh his recollection with respect to the 45-

hour consecutive flow to which he has testified. *A* I find—shall I answer the question?

Trial Examiner: You may answer the question.

A I find on referring to The Connecticut Valley Power Exchange load control supervisor's log sheet, that there were five hours during the 45-hours of consecutive flow of Massachusetts energy to all points on the CP lines during which, as indicated by meters at South Meadow, energy from the Hartford Electric Light system was also transmitted—I will correct that. There were six hours in those 45 hours during which energy from the Hartford Electric Light system was transmitted to the CP 1 and CP 2 lines.

Q During the other 39 hours, was Massachusetts energy exclusively delivered at all points from the CP-1 and CP-2 lines? *A* The meter readings indicate that to be so.

Q In your examination of the log sheets, did you find [*1567*] instances in which generation of energy, of electric energy in Connecticut, was shown to have been stopped in order to permit Connecticut loads to be carried by generators in Massachusetts? *A* I have seen in the Housatonic division log sheets a reference to shutting down Falls Village in order to let Cabot station carry full loads. I have also seen a reference to the shutting down of the Falls Village for a test run on Cobble Mountain station.

Q What did shutting down Falls Village mean? *A* It meant the cessation of generation at the Falls Village plant.

Q And what did letting Cabot carry—what was the reference to Cabot? What did that mean? *A* It means that Cabot station would be allowed to generate more energy than it would generate if the Falls Village were operating.

Q What is Cabot? *A* The Cabot plant, I believe, is a plant of the Turners Falls Power and Electric Company in Massachusetts.

Q And what is Cobble Mountain? *A* Cobble Mountain is also a plant in Massachusetts, one of the Western Massachusetts Companies system.

Q From the study you have made are you able to say whether

the 321 days to which you referred in your testimony as being days on which you found Massachusetts energy being delivered [1568] to the CP 1 ad CP 2 lines, are you able to say whether those 321 days were the only days in the period covered by your study, or which Massachusetts energy was delivered to The Connecticut Light and Power Company at one or more of the following points, that is, at Portland, for its East Hampton division, at Bristol for its Bristol division, or at Torrington through The Torrington Electric Light Company for its Winsted division?

Mr. Branch: I object. I think that contains several assumptions of which there is no evidence. I think the question assumes that on all of these days there was Massachusetts energy delivered to our plant. I don't understand there is any evidence as to that. There was evidence, I think, that he picked out days in which Massachusetts energy was received at South Meadow, and possibly there was some relation to what Falls Village was doing on that day. But I don't think that the witness testified that on these days Massachusetts energy was going to our loads.

Trial Examiner: I think it has been so testified, Mr. Branch. It is at least a part of a chain of proof, and perhaps the question may be a little leading. I think if it were worded otherwise—

Mr. Branch: I will object to it in that form.

Mr. Wahrenbrock: I will ask one or two preliminary questions, if I may.

By Mr. Wahrenbrock: [1569] *Q* Will you, to refresh your recollection, tell us the flow conditions for which you selected the 321 days? *A* May I have the question so I can answer it correctly?

Trial Examiner: The reporter will read the question for the benefit of the witness.

(Whereupon the last question as above recorded, was read by the reporter.)

A The days were selected as having hours when the generation at Falls Village was zero, or less than the delivery to Central Hudson Gas & Electric Corporation, simultaneously with the receipt of South Meadow of energy from Massachusetts.

Mr. Branch: May I have that answer read?

(Whereupon the last answer as above recorded, was read by the reporter.)

By Mr. Wahrenbrock: *Q* In that selection, did you take into account the load of the Housatonic division? *A* I did not. Could I amplify my answer?

Trial Examiner: What is that?

The Witness: I would like to amplify my answer. I haven't quite stated—

Trial Examiner: You may complete your answer, if you wish to.

The Witness: In my study of the log sheets of the [*1570*] Connecticut Valley Power Exchange, I noted days, and I think I have stated that previously, when the generation at Falls Village was zero, or small, in the order of approximately a thousand kilowatts or less, and I also noted days having hours when the generation at Falls Village was less than the delivery to the Central Hudson Gas & Electric Corporation, or slightly more than the delivery to the Central Hudson Gas & Electric Corporation. In the selection of the 321 days, I made use of only those days having hours when Falls Village generation was zero, or the Falls Village generation was less than deliveries to the Central Hudson Gas & Electric Corporation.

By Mr. Wahrenbrock: *Q* Under such flow conditions, would Massachusetts energy be delivered to some one or more of the delivery points at which The Connecticut Light and Power Company was supplied with electric energy from the CP 1 and CP 2 lines?

Mr. Branch: I would like to know whether by that question you mean to include Hartford itself?

Mr. Wahrenbrock: I don't understand the question.

Trial Examiner: He is asking whether you mean whether it is delivered to Hartford.

Mr. Wahrenbrock: I don't know that the record showed The Connecticut Light and Power Company had any delivery at Hartford.

Mr. Branch: I believe there was a contract by which they did, yes, sell to Hartford.

[*1571*] Trial Examiner: Are you talking about selling to Hartford or taking deliveries from Hartford? I don't think counsel understand each other on that.

Mr. Branch: Excuse me. I meant Connecticut Power Company. My associates said Connecticut Light and Power, but I understood the question is whether these conditions would establish the fact that some of the load that was served by Connecticut Power Company must have received Massachusetts energy, and I wanted the question clarified to make sure whether they included Hartford.

Mr. Wahrenbrock: I think if the question is read counsel will see that it is not as he thought.

Trial Examiner: The reporter will read the question back.

(Whereupon the last question as above recorded, was read by the reporter.)

Mr. Branch: My point about Hartford is obviously mistaken. I didn't get the "Light and Power".

Trial Examiner: The witness may answer the question.

A Yes, I noted that during many of the hours when the Falls Village generation was shown to be only either very small, as I have explained, or slightly larger than the deliveries to Central Hudson Gas & Electric Corporation, the delivery to Bristol, as shown on the log sheet, was greater than either the amount of Falls Village generation in one case or the difference between the Falls Village generation and the [*1572*] deliveries to the Central Hudson Gas & Electric Corporation in the other case, indicating, therefore, that Bristol, and therefore Middletown and Portland could not have been supplied from the Falls Village generation and must have been supplied from South Meadow substation, which was simultaneously receiving energy from Massachusetts.

By Mr. Wahrenbrock: *Q* Now, were those 321 days the only days when the Connecticut Light and Power Company would be receiving at Portland through the Middletown Division of The

Connecticut Power Company, or at Bristol from The Connecticut Power Company, or at Torrington, through The Torrington Electric Light Company from The Connecticut Power Company, energy which included or consisted exclusively of Massachusetts energy? *A* No, my explanation that I have just given clearly shows that there are many other days when those points were receiving in whole or in part Massachusetts energy.

Q Other than the 321— *A* Other than the—

Mr. Branch: I object to that general statement "many other days" and ask that it be stricken out on the ground that more definite information should be applied, if the matter is to be opened up at all.

Trial Examiner: I don't think the statement "many other days" is objectionable. I think that may be clarified by [*1573*] counsel for the respondent on cross examination, if you wish. However, I would like to have that question read back. There is another point in there which I rather question the clarity of. Will you read the question for the benefit of the Trial Examiner?

(Question read by reporter.)

Mr. Branch: I ask that the answer be stricken.

Trial Examiner: The motion is overruled. The answer will remain on the record. However, I would ask the witness to clarify that point.

The Witness: I stated in my explanation of the previous question that I noted from an examination of the Connecticut Valley Power Exchange log sheets that during some hours the Falls Village generation was small, of about the order of 1,000 k. w. and that during many of those hours I also noted that Bristol received more energy than was being generated at Falls Village. This made it apparent that Falls Village could not have supplied the delivery to Bristol, and therefore energy from South Meadow must have been delivered, at least in part, to Bristol, and if those same hours South Meadow was receiving Massachusetts energy, then Bristol must have been receiving at least in part Massachu-

setts energy, and if Bristol was receiving Massachusetts energy Middletown and Portland must have been receiving Massachusetts energy. I also stated that I noted hours when the Falls Village [*1574*] generation exceeded by a small amount the deliveries to Central Hudson Gas & Electric Corporation, and during many of those hours I noted that Bristol received more than the difference between the generation at Falls Village and the deliveries to Central Hudson Gas & Electric Corporation. It is therefore evident that Bristol could not have been supplied entirely from Falls Village generation, and therefore Bristol must have received energy from South Meadow and if Bristol received energy from South Meadow, Middletown and Portland received energy from South Meadow and the energy at South Meadow during those hours was in whole or in part energy received from Massachusetts, and therefore, it is evident that Bristol and Portland both received during those hours energy from Massachusetts.

Trial Examiner: I think the witness has stated his point and explained what I wanted to know.

By Mr. Wahrenbrock: *Q* And that last category of instances was one outside the 321 days you included in your selection? *A* That is correct.

Trial Examiner: The words of the witness's answer to my question, beginning with "And therefore" may be stricken from the record, as being beyond responsiveness to the question.

Mr. Wahrenbrock: I am sorry, I don't understand that.

Trial Examiner: He again stated his conclusion, in answer [*1575*] to my question, which had nothing to do with the conclusion, but I wanted to know what his former testimony was, to which he referred as the background of his answer to your previous question. To that extent it was not responsive to my question, and I asked that it be stricken from the record.

Mr. Wahrenbrock: I would like to know what the portion being stricken is. I am not clear in my mind.

Trial Examiner: Will you read that portion for the benefit of counsel?

(The record is read by the reporter.)

Trial Examiner: That is the portion of his answer to my question.

Mr. Wahrenbrock: Mr. Examiner, I think that the portion which you suggest striking is relevant and material.

Trial Examiner: I think it has already been testified. I simply asked him upon what he based his answer. He referred to previous testimony. I think it is a repetition of his conclusion. He is basing his statement upon a certain set of facts, and not upon his own conclusion. I would suggest that counsel look at the transcript during the noon hour and he may understand more fully then the purpose of the correction made.

Mr. Wahrenbrock: I will do that. I am a little bit disturbed that it should be there. I would like to have an opportunity to get it into the record if on study it appears to me that it should be there. [*1576*] I would like to ask the witness this question, to clear up an omission, I believe.

By Mr. Wahrenbrock: *Q* What was the generating capacity of the Leesville plant which was destroyed in the hurricane and the flood of 1938? *A* 390 k. w.

Q What were the average monthly maximum demands and the annual monthly demands of the purchases of the East Hampton District of The Connecticut Light and Power Company from The Connecticut Power Company at Portland, during the years 1937, 1938 and the first six months of 1939?

Mr. Branch: May we have that question read?

Trial Examiner. The question will be read for the benefit of respondent's counsel.

(Question read by reporter.)

A The average monthly maximum demands for the years 1937, 1938 and the first six months of 1939 were 842.6 k. w., 1,017.2 k. w., 1,065.6 k. w., respectively. The annual maximum demands for the years 1937; and 1938, were 1,176 k. w. and 1,324.8 k. w., respectively. The highest maximum demand during the first six

months of 1939 was 1,200 k. w. The demand in each case was a 30 minute integrated demand.

Q Are you able to state the capacity of the industrial [*1577*] plant to which you referred in the East Hampton District of The Connecticut Light and Power Company? I believe it was referred to as the Brownell Company plant, as requested by the Examiner yesterday. *A* No. Since that question was asked by the Examiner, I have made unsuccessful efforts to secure the information. I would like an opportunity to investigate further and to testify to this matter at a later time during the hearing.

Mr. Wahrenbrock: If that can be arranged, Mr. Examiner, I should like to have an opportunity to recall Mr. Miller on that point for further direct examination, later.

Mr. Branch: I think we can spare you that effort. I am willing to stipulate that it was negligible.

* * * * * * [*1581*]

PERCY H. THOMAS,

a witness called on behalf of the Federal Power Commission, being first duly sworn, testified, as follows:

Direct Examination by Mr. WAHRENBROCK.

Q Will you state your name and residence. *A* Percy H. Thomas, 38 Palisade Road, Atlanta, Georgia.

Q What is your position with the Federal Power Commission? *A* I am at present the regional director of the second administrative district of the Federal Power Commission, headquarters at Atlanta.

Q What is your profession? *A*. Engineer.

Q Will you please describe your training and experience as an engineer in a general way. *A* Technical education at the Massachusetts Institute of Technology, Boston, Massachusetts; degree of B.S. in electrical engineering. First ten years with Westinghouse Electric & Manufacturing Company, Pittsburgh and East Pittsburgh, Pennsylvania. First few months of this period as an

apprentice, later in charge of inspection of defective transformers returned from service. Later, in charge of development and design of [*1582*] lightning protective apparatus applied to power systems. My experience with this company involved laboratory and research work, much of which related to transformers. My duties involved many inspections of power transformers, breaking down in service, a frequent occurrence in the early days of electric utilities. I remember one three-months' trip to the Pacific Coast extending from Los Angeles to Seattle, and another of the same length in Utah and Montana, making investigations of the effects of lighting and similar disturbances on the high tension lines and transformers of certain electric utilities operating in those regions.

Q Did I understand you to say of "some length" or "the same length"? *A* Of the same length. During this period I presented two important papers, based partly on this work, before the American Institute of Electrical Engineers: one on static strains in electric circuits at a meeting held at Columbia University in New York, in 1902; and the other on the results of my investigations, at a meeting in Asheville, North Carolina, held in 1904. These are published in the transactions of the Institute for these years. May I ask if I am speaking loud enough?

Trial Examiner: You are for my benefit. I don't know about counsel. Will counsel state whether he is able to hear [*1583*] the witness?

Mr. Branch: Yes, sir, we are able to hear, as long as our friend, Mr. Thomas, is not competing with the locomotives.

The Witness: During this ten years, the art of high tension transmission, and of course the power transformer, made great strides, and I was fortunate enough to be intimately connected with it by my connection with the Westinghouse Company which took the leading part in that work.

For the next four years I was the chief electrician of the Cooper Hewitt Electric Company, which was a personal enterprise of George Westinghouse, undertaken to develop the famous mercury vapor vacuum invention of Peter Cooper Hewitt.

I had charge of a research laboratory developing various practical applications, and of the design of commercial apparatus. While at that time the operations were not on a large scale, the types of tube lamps and mercury arc rectifiers that have developed from these types are now very widely used. I may point out that such mercury arc rectifiers serve to change alternating current to direct current, and that that application made use of power transformers. This service involves specially exacting requirements and special designs of transformers are appropriate.

In 1907, I became an independent consulting engineer with offices in New York City, and for four years I had a partner with an office in Boston. During this general period I devoted [*1584*] much time to the interests of the American Institute of Electrical Engineers. In 1913 and 1914, I designed the 110 k.v. transmission line by the well known mining and reduction company of the Chile Copper Company, located at Chuquicamata near Calama, Chile. This was an enterprise of the firm of Guggenheim Brothers, the first installation having capacity for the handling of 10,000 tons of ore a day, and an equal amount of waste.

In 1916, this firm of Guggenheim Brothers set up a large engineering and construction organization for the purpose of enlarging the mine at Chuquicamata to four times the size, and to make several other important mining installations in South America. I was consulting electrical engineer in this organization, in charge of the power department, with headquarters in New York City. Several high tension lines were included in the installations which we designed.

In 1923, the installations being completed, the firm of Guggenheim Brothers disposed of these plants to others, and disbanded their engineering organization. These plants are now in highly successful operation. I will add that during a relatively slack period, my department with Guggenheim Brothers was commissioned to design a 30,000 horsepower hydroplant at Maitenes, Chile, including a 110 k.v. transmission line, the whole constitut-

ing an important addition to the then English owned utility system [*1585*] supplying the capital of Chile, the City of Santiago; also the transmission and transformer system installed at that time in connection with the electrification of the main lines of the Government railroads, connecting Santiago and Valpariso, some 150 miles apart. Both of these installations are still in service, and have been greatly extended.

I was one of the two representatives of the American Institute of Electrical Engineers appointed to the joint committee on overhead and underground crossings of power circuits over other circuits. I believe that title is not literally correct, but it is very close. This committee organized a number of years ago to make rules covering crossings and joint line constructions for various types of electric lines, included representatives of the American Institute of Electrical Engineers, of the American Telephone & Telegraph Company, of the National Electric Light Association, and of the American Railway Association. It was the first national body to draw rules for such crossings.

I made a trip to Brazil in 1929 for the Canadian and General Finance Organization, Toronto, Canada, to make reports on a number of the important problems involving the design and performance of their 132 k.v. lines, the practicability of interconnecting the cities of Rio de Janiero and San Paulo, 350 miles apart, with electrical circuits, and in general, to advise on the best methods of remodeling their distribution and transmission [*1586*] arrangements in Rio de Janiero itself.

I was a member of the Pan American scientific Congress about 1915, presenting a paper on the then present state of electric power system development.

During the participation of the United States in the first World War, I was consultant to Frederick Darlington, chief of the power section of the War Industries Board. This was a part-time work.

In 1923, I resumed my position as an independent consulting engineer, and which work I continued until 1934, when I joined

the staff of the National Power Survey, set up by the Federal Power Commission.

In 1924, to 1926, I made two extensive studies of the possible economies through interconnections of electric utilities in areas by high tension transmission lines; a paper on the first of these studies was presented by invitation before the American Institute of Electrical Engineers at a convention at Birmingham, Alabama, in 1924. It was entitled, "New type of high tension network", and was published in the transactions of the society for that year.

The other involved a year's work for a group of the leading electric utilities in New England and Eastern New York, including the then New York Edison Company. While this involved transmissions and economies of interconnections on a large scale, it was for the confidential information of that group [*1587*] and was never published. I have referred to the doing of this particular work only as a part of my statement of experience.

I have made numerous studies of important prospective transmission lines and power plants. I mean, enterprises that were never carried out. These included a transmission system for providing electric power to mining and other enterprises in the high country of Bolivia, the transmission lines from the Volcan River in Uruquay to Montevideo, and a special design for the line from Boulder Dam to Los Angeles, as also one for the high tension lines of the Metropolitan Water District of Southern California. I have taken a great interest in the activities of the American Institute of Electrical Engineers, and those of the American Society of Mechanical Engineers. I am a Fellow of the former and a full member of the latter. I have served on many committees of both societies, especially for the American Institute of Electrical Engineers, and was elected for a term each—

Trial Examiner: If you will suspend for just a moment.

(This was because of the noise caused by a passing train.)

Trial Examiner: Suppose you start back three sentences.

The Witness: I am a Fellow of the former and a full member

of the latter. I have served on many committees of both societies, especially for the American Institute of Electrical [*1588*] Engineers and was elected for a term each as manager and vice-president therein.

This society has a standing committee known as the Committee on Power Transmission and Distribution. I have served several terms as chairman of this committee. The duties of this committee include the passing upon papers offered to the Institute, bearing on electrical transmission and distribution subjects, and the general forwarding of the interests of engineers in this branch of the electrical art.

I presented many papers before technical societies, and have written many articles for the technical press in my 40 years' experience as an electrical engineer. A number of these related to electric transmission and transformers.

I am a patentee of a considerable number of United States Patents in electrical subjects, including power transmission.

I have testified in the courts often on electrical subjects. Perhaps that will be sufficient.

By Mr. Wahrenbrock: *Q* Were you present at this hearing through the entire time Mr. Harold Miller was on the stand? *A* Yes.

Q Did you hear all of his testimony? *A*. I did.

Q Are you familiar with the table which is Exhibit 61 for Identification, and diagrams which are together as Exhibit [*1589*] 62 for Identification? *A* Yes.

Q Have you studied and familiarized yourself with the methods used by Mr. Miller in his study and in the statements he has made in his testimony? *A* Yes.

Q Do you understand the principles on which that study was based? *A* I do.

Q Have you made a study of the facilities by means of which electric energy from Massachusetts was supplied to the Winsted and Bristol districts, and prior to July 1, 1939, to the East Hamp-

ton District of The Connecticut Light and Power Company in Connecticut as shown by Mr. Miller's testimony? *A* I have.

Q Will you please describe the study you have made? *A* I have examined the maps of the circuits as furnished to the Federal Power Commission by the various companies involved, have looked over many of the log sheets, and have personally visited most of the stations and many of the lines involved which are located in Connecticut. I have examined the data to satisfy myself as to the flow of energy in the circuits at various times, places, and under different conditions. I will add that I have had a reasonably good knowledge of the systems of this territory for many years.

[*1590*] *Q* Directing your attention to the instances of flows of electric energy from Massachusetts to points in Connecticut as shown by Mr. Miller's study, and particularly to those instances in which the electric energy requirements of the Winsted and Bristol districts, and prior to July 1, 1939, to the East Hampton district of The Connecticut Light and Power Company, were supplied solely by electric energy from Massachusetts, except that a part of the Winsted requirements may also have been supplied from the Robertsville plant of The Connecticut Light and Power Company, will you please state what the primary principle is which underlies the statement that those loads were supplied from Massachusetts?

Mr. Branch: Well, I object to that. It is assuming a great deal that this witness hasn't testified to, and I think it is immaterial, or until something further is shown.

Trial Examiner: Read the question back.

(Whereupon the last question as above recorded, was read by the reporter.)

Mr. Branch: I think that is an improper way to try to get the evidence in, in addition to my other objection.

Trial Examiner: The witness has testified he heard all of the testimony of the other witness, and that he made a study of the

record itself. The objection is overruled. The witness may answer the question.

[*1591*] *A* In answering your question, it is necessary to explain what is involved in supplying a load to an electric utility's system. Supplying a load, as it is expressed in general parlance, means the doing of work in a physical sense.

Technically speaking, work is the overcoming of a resistance through some definite distance, that is, to do work it is necessary to apply a force equal to or superior to the resistance to be overcome, and to cause that force to continue until the resistance is overcome through the whole prescribed distance.

The amount of work is then quantitatively equal to the product of the amount of the resistance overcome by the distance over which the resistance is overcome. In lifting a weight of 100 pounds 2 feet, the work done is 200 foot-pounds. The load in an electric utility system is made up of various appliances, motors, lights, heaters and so forth, in the operation of each of which a certain amount of work is performed and an equivalent amount of energy is required. The aggregate of these amounts of energy is the load on the system.

Work is of the nature of resistance and is something that must be overcome. That something that overcomes resistance and does work is energy. Energy is an entity and it can neither be created or destroyed. Like the conservation of matter, the [*1592*] doctrine of the conservation of energy is universally recognized. It is to the effect that there is in the universe now existing a definite amount of energy which can neither be increased nor decreased. To do useful work energy is required and this energy must be obtained from some existing stored supply.

Many of the sources of stored energy in nature are well known. For example, the coal pile in the steam plant or the water stored in a hydro plant reservoir represents stored energy. So do the elements of a charged storage battery. One of the simplest forms of stored energy is the compressed spring, ready to run a toy train. Energy is stored in every magnetized magnet core. It is

the main purpose of an electric utility to secure stored energy for its distribution operations from the most advantageous source and to make it available on demand at the premises of ultimate consumers, to do work there.

Historically speaking, general distribution of power by the utilization of various means has been proposed, as for example, by compressed air, a long cable drive, or by water or oil in pipes under pressure. In its present state of development, however, the electric circuit offers a flexibility and an efficiency in the distribution of energy far beyond any imagination of our great grandfathers. The energy released from its stored supply by the electric [*1593*] utility system in getting to the ultimate consumer makes use of many carriers in reaching that consumer.

For example, the hot molecules of gas in the flame of the boiler furnace, the heated molecules of iron in the walls of the boiler tubes, the vibrating molecules of water in the steam, the high-velocity steam jet in the turbine, the mechanical torque in the rotor of the generator, the electrical reactions in the circuit connecting the generator with the load, including transmission lines, distribution lines and transformers.

In the case of the hydro-generator, the stored energy of the water in the reservoir is carried by the water-jets in the turbine in the torque on the water-wheel shaft through the generator to the electric circuit. There is, of course, a certain dispersion of energy largely in the form of heat-losses in each of the carriers, but the adaptability of the laws of nature is such as to make possible a highly satisfactory overall efficiency.

I may point out that the adjectives "electrical", "magnetic", "kinetic" and so forth may be used with the word "energy" to indicate with what character of carrier, by what means of measurement, by what type of storage, the energy is associated.

Since energy can neither be created or destroyed, this whole operation may be set up as a bookkeeping problem. The system is debited with a certain amount of energy at the power [*1594*] plant, and this must then be entirely accounted for; starting at

the coal pile a portion is lost by the well-known dispersion of energy in heat and otherwise in the various stages as the energy is passed along.

A part is dissipated as heat in the transmission-line losses, a part in transformer losses, a part is used for lighting and various facilities in the power houses, and substations for the utility's own use, and finally, the balance is divided among the various ultimate consumers.

Energy may be likened to credit in a bank. Each is an indestructible entity with only one characteristic: With energy, the power to do work; with credit, the power to buy.

The holder can draw his credit in one-dollar bills or ten-dollar bills or in double-eagles. He can deposit pennies or thousand-dollar bills. The bank account knows only the aggregate amounts. Energy may be carried in an electric circuit or by mechanical or electrical means and may be finally delivered at the same point, and when once delivered, all traces of the means of conveyance is lost.

Or energy may be withdrawn from a stored supply by any of these means and no way of telling by what means it travelled is shown, from any characteristic of the received energy.

With this explanation I now turn to the specific instances of the flows of electric energy from Massachusetts to points in [*1595*] Winsted, Torrington and East Hampton, as inquired of in your question.

In view of the doctrine of conservation of energy, there can be no energy created in the system. Since none is supplied by any of the generators located in Connecticut, it follows that the energy supplied to the loads at Winsted, Bristol and East Hampton, must come from Massachusetts.

Q As a matter of common and accepted engineering practice, can the flow of electric energy between a source of supply and a load be detected? *A* Yes. That is regularly done in service.

Q How? *A* By suitable instruments.

Q What is a common type of such instrument? *A* The electrical watt-meter.

Q Can the direction of flow of electric energy between sources of supply and loads be ascertained? *A* Yes.

Q How is that done? *A* By suitable instruments.

Q And what is a common type of such instrument? *A* The electrical watt-meter.

Q Can the rate of flow and the amount supplied during any convenient period of time be measured? *A* Yes.

[*1596*] *Q* How will that be done? *A* By suitable instruments.

Q And what is a common type of such instrument? *A* Electrical watt-meters and watt-hour meters.

* * * * * * [*1598*]

Mr. Wahrenbrock: Then may I ask—may I at this time offer Exhibit 59 for Identification in evidence.

Trial Examiner: Apparently there is no objection. It will be received in evidence.

(Exhibit 59 for Identification received in evidence as Exhibit 59.)

* * * * * *

Q Mr. Thomas, assuming that log sheet entries, meter records, and other data on which Mr. Miller based his study are substantially correct within the limits stated by him, and that he has correctly reflected those data in the figures which appear in his flow tables, and has correctly reflected them in his flow diagrams, in your opinion, is it valid to state that no electric energy was being supplied from generating capacity of The Hartford Electric Light Company at Hartford, Connecticut, from the generating capacity of The Torrington Electric Light Company at Torrington, and from the Falls Village generating plant of The Connecticut Power Company at Falls Village, Connecticut, or from any other connection of The Connecticut Power Company, and that none or only a limited amount was supplied as shown from the Robertsville plant of The Connecticut Light and Power

[*1599*]

Company, near Winsted, Connecticut, during the periods when he has so indicated? *A* Yes.

Q Directing your attention to those instances—

Mr. Branch: Excuse me. I didn't realize you had finished your question. May I have that read?

Trial Examiner: The reporter will read the question for the benefit of counsel.

(Whereupon the last question as above recorded, was read by the reporter.)

[*1600*] Trial Examiner: Am I correct in believing that you read there "Is it valid to state?"

Mr. Wahrenbrock: Yes.

Mr. Branch: I object to that question as containing altogether too many questions involving a great many different subjects.

Trial Examiner: This appears to be in the nature of a hypothetical question. Is it possible to break this down into two questions, Mr. Wahrenbrock?

Mr. Wahrenbrock: Mr. Examiner, this isn't the simplest subject and it isn't the narrowest subject. I have a great many questions that are going to attempt to elicit a complete picture in each question. If we have to break it down it is going to destroy the complete continuity of the story. This is a technical question addressed to a man who has been qualified to consider it, who is being put on after study, after having had a chance to prepare himself, and I see no objection to covering as completely as this question attempts to cover the subject which it does cover.

Mr. Branch: I do object. I think he is asked to answer a good many different things in that question, and that it is improper.

Mr. Wahrenbrock: Well, if they can be answered, what is the objection?

Trial Examiner: It seems to me that the question is proper. [*1601*] However, I would like some explanation of what counsel means, of what the witness understands by the expression "valid".

Mr. Wahrenbrock: Well, the witness can make a statement, if you are addressing him.

Trial Examiner: I would like to have the witness make a statement as to how he understands it.

The Witness: I understand it in the sense of "correct".

Trial Examiner: With that understanding, the witness's answer will be permitted to stand. Your objection was more in the nature of a motion to strike, was it?

Mr. Branch: Yes, sir. I move to strike the answer, because the witness answered before I had an opportunity to speak.

Trial Examiner: The motion is rejected. You will note an exception for the respondent.

Mr. Wahrenbrock: I will now begin my next question over again.

By Mr. Wahrenbrock: *Q* Directing your attention to those instances as shown by Mr. Miller, in which the electrical energy requirements of the Winsted, Bristol and East Hampton districts of the Connecticut Light and Power Company were supplied from Massachusetts, and from Hartford generating capacity, except that a part of [*1602*] the Winsted requirements also have been supplied from the Robertsville plant of The Connecticut Light and Power Company, please state whether in your opinion each of those loads was supplied by electric energy from both of such sources, that is, Massachusetts and Hartford, as shown by Mr. Miller.

Mr. Branch: Same objection; also this isn't a proper way of putting in testimony.

Trial Examiner: The witness may answer the question.

A Yes.

By Mr. Wahrenbrock: *Q* And what would you say is the primary principle which underlies the statement made by Mr. Miller with respect to the relation of the ratio of Massachusetts energy to the total of Massachusetts and Hartford energy received by The Connecticut Power Company at South Meadow—

Mr. Branch: I object.

Mr. Wahrenbrock: May I complete my question, please?

Trial Examiner: You may complete the question.

By Mr. Wahrenbrock: *Q* (Continuing) —to the ratio of Massachusetts energy to the total Hartford and Massachusetts energy supplied to East Hampton, Bristol and Winsted.

Mr. Branch: I don't quite understand how, even within the scope of your Honor's rulings on the last two questions, this witness can be asked as to the underlying principles, as to [*1603*] work or opinion of some other man.

Trial Examiner: It seems to me it is rather far-fetched to state the principles underlying a statement. That pre-supposes the knowledge of this witness as to what the other witness had in his mind. I would suggest that be reworded to avoid that situation, Mr. Wahrenbrock.

Mr. Wahrenbrock: I would like to make a statement, Mr. Examiner. I am prepared to ask several questions which will come out the same place. However, I do want to point out that this witness has stated that he has heard the testimony, that he is familiar with the study that has been made, and I am asking him now about the validity of the statements made on the basis of that study.

Trial Examiner: He can state the underlying principles as regards the facts, but as to the statement, that involves a presumption that he knows the mind of the witness throughout.

Mr. Wahrenbrock: Would it meet your Honor's objection if I asked him the principle which underlies the conclusion, if it is a conclusion?

Trial Examiner: Is there an objection to the question on that point?

Mr. Branch: That is substantially the same thing, your Honor, and open to the same objection, and I would object.

Mr. Wahrenbrock: The point being that you have a statement of the facts shown by a study. I now wish to explore the [*1604*] engineering principles behind those facts. I am not interested in them as statements by any individual person, but as statements of facts, which I wish to explore.

Mr. Branch: It seems to me that statements of engineering

principles are a matter of opinion, and this matter can't interject principles which in his opinion are correct and as to somebody's conclusions.

Trial Examiner: I think he may do that. Having made a complete study of the matter himself, as I understand it, the objection will be overruled and the witness may answer the question in the second form given.

The Witness: May I hear it?

Mr. Wahrenbrock: If I may have just a moment, please?

[*1605*] Trial Examiner: I would suggest that counsel reword the question. It has been rather switched around now.

Mr. Wahrenbrock: Yes.

By Mr. Wahrenbrock: *Q* Mr. Thomas, what would you say is the primary principles which underlies the conclusion as stated by Mr. Miller with respect to the relation of the ratio of Massachusetts energy to the total of Massachusetts and Hartford energy received by the Connecticut Power Company at South Meadow—

Mr. Branch: It is understood that I object.

Mr. Wahrenbrock: May I be free to finish the question without interruption?

Trial Examiner: Proceed.

Mr. Wahrenbrock: The question is complicated enough without being interrupted twice.

Trial Examiner: Proceed.

Mr. Wahrenbrock: I am going to repeat it over again in order that the witness may have it in mind.

Mr. Branch: And will the witness wait then until I have an opportunity to object.

By Mr. Wahrenbrock: *Q* What would you say is the primary principle which underlies the conclusion as stated by Mr. Miller with respect to the relation of the ratio of Massachusetts energy to the total of Massachusetts and Harford energy received by the [*1606*] Connecticut Power Company at South Meadow to the ratio of Massachusetts energy, to the total of Hartford and Massachusetts energy supplied to East Hampton, Bristol, and Winsted?

Mr. Branch: I object. I don't see how this witness can state the principles which underlie someone else's conclusions.

Trial Examiner: The conclusions have been stated, and the witness will be permitted to answer. The objection is overruled.

The Witness: Where electric currents or electric energy coming from two sources enter a conductor at a certain point and traverse the conductor to some further point, the usual working concept or hypothesis is that the two currents mix and comingle in an intimate way, and that any portions of the mixed current drawn off from the conductor at various later points will have about the same proportions of the two component currents as was contained at the point of mixing. This is not based on tagging individual current flows, but on the common sense analogy with the mixing of streams of any kind in a long and narrow passage.

Q Is that principle consistent with all the known facts and with recognized and accepted engineering practice and principles?

Mr. Branch: Well, I think all he can do is give his opinion on that and I object to it unless it is put in the form of his opinion.

[*1607*] Trial Examiner: I suggest that this is an opinion, an expert opinion that you are asking.

Mr. Wahrenbrock: I will rephrase the question.

By Mr. Wahrenbrock: *Q* In your opinion, is that principle consistent with all the known facts and with recognized and accepted engineering practice and principles?

Trial Examiner: The witness may answer.

A Yes, so far as known to me.

By Mr. Wahrenbrock: *Q* In your opinion, is that a reasonable principle? *A* I will say that I subscribe to that principle.

Q Directing your attention to the instances of energy flow from Massachusetts as shown by Mr. Miller, and particularly to those instances in which all or a part of the electric energy requirements for the Winsted, Bristol and East Hampton districts of The Connecticut Light and Power Company, or one or more of them, were

supplied with electric energy from Massachusetts, at times when there was some generation of electric energy at the Falls Village plant, will you state what other primary principle underlies the conclusion that those loads were supplied in whole or in part from Massachusetts?

Mr. Branch: The same objection, on the ground that he is asked to state the principles as to someone else's conclusions.

Trial Examiner: The objection will be overruled. You [*1608*] may answer.

The Witness: The principle that there will be no simultaneous counter flow in any electric circuit, that is, that neither current nor energy can physically flow in both directions in the same conductor, at the same time.

Q Is that principle, in your opinion, valid and consistent with recognized and accepted engineering practice and theory? *A* Yes. I have agreed with the conclusions of Mr. Miller in the study of the power question, relying upon a well known axiom of the flow of current in electric circuits, namely, that current can flow in a single circuit, only in one direction, at any instant of time; that is, what might be termed simultaneous counter flow, cannot exist. This is equally true of energy. This fact is known by experience in electric systems.

I will use the expression E.M.F. as an abbreviation for electro motive force, voltage, or difference of potential. If now, the experiment be tried, first applying a single E.M.F. at one end of a circuit and noting the current, and then after removing the first E.M.F., of applying a second E.M.F. at the other end, and producing a second current in the circuit, and finally, of applying both E.M.Fs at the same time, it will then be found that the total current in the circuit will be the difference of the first two observed currents, and will be in the direction of the greater. In other words, energy cannot [*1609*] be delivered both ways over a circuit at the same instant of time. Of course, in the algebraic sense that when the two currents flow in opposite directions, one must be marked with a minus sign, then the resultant current will

be the sum of the positive current and the negative current, which is, of course, the same as the difference, and comes back to the original answer.

Q When you say "sum of the positive current and the negative current", do you mean the algebraic sum? *A* Yes.

Q Excuse me for interrupting. *A* This is but common sense, since if there is generation and consumption at both ends, obviously the generation at either end will be applied to the nearby load before energy will flow to the other end through the resistance of the line. This will leave a balance to be sent into the line at one end only. If the universally accepted hypothesis be applied that current flows in a conductor as other flows occur, it is obvious that the propelling forces that are set up in the conductor to move a portion of this current in one direction, cannot also move the other portion of the current in the other direction. Thus, it is shown that simultaneous counter flow cannot occur either with energy or with current.

Q Directing your attention to the instances as shown by Mr. Miller, in which electric energy requirements for the Winsted, [*1610*] Bristol, and East Hampton districts of The Connecticut Light and Power Company were supplied in whole or in part from Massachusetts, will you please describe in a general way the system of facilities by which that was accomplished, and state the functions performed by the several parts of that system respectively. *A* The facilities by which electric energy was conveyed from the Massachusetts line near Agawam to local consumers at East Hampton, Bristol and Winsted, may be listed as follows:

• From the State line to the South Meadow high tension outdoor substation of the CP Company, a double circuit 66 k.v. steel tower transmission line, until about March, 1941. These two circuits, each of which at the Hartford end includes an autotransformer, are identified by the company as C-3 and D-4. Soon after March, 1941, the D-4 line was changed over to 110 k.v., and connected through a 110 k.v. transformer directly to The Hartford Electric Light Company, 11 k.v. bus. The length

of transmission line from the State line to South Meadow is given at 27.14 miles.

The C-3 line since about March 1941, and prior thereto, both the C-3 and the D-4 lines, together with their auto-transformers were facilities for transmitting Massachusetts energy to the Connecticut Power Company's 66 k.v. bus at South Meadow.

The 66 k.v. lines, Cp-1 and CP-2, and the 66 k.v. branch [*1611*] lines connecting thereto, together with the 66 k.v. step-down transformers and all synchronous condensers to which they are connected, are facilities for transmitting electric energy to the corresponding substations including the substations at Middletown, Bristol, and Torrington. Since change in the D-4 line to 110 k.v., some time in March this year, the three circuits known as 122, 123, 124, at South Meadow, each including a transformer, connecting The Hartford Electric Light Company's 11 k.v. bus to The Connecticut Power Company's 66 k.v. bus, at South Meadow, may be such facilities, if at times, by reason of the circuit D-4 feeding energy to The Hartford Electric Light Company's 11 k.v. bus, they are transmitting mixed Massachusetts and Hartford energy from the 11 k.v. Hartford Electric Light Company bus to the 66 k.v. Connecticut Power Company bus.

The substation buses and equipment at the Middletown substation, and the 13.8 k.v. line, crossing under the Connecticut River by submarine cable, and leading to pole 110 in Portland, and before its removal in 1939, the extension of that 13.8 k.v. line to East Hampton, Colchester, and Leesville, and their step-down transformers are facilities for transmission of Massachusetts energy to East Hampton, Colchester, and Leesville.

Trial Examiner: I suggest that the witness suspend with his answer for a moment.

(A short intermission was taken.)

[*1612*] Trial Examiner: The witness may proceed with his answer.

A (Continuing) The outdoor substation of the C. L. & P. Company at Bristol—

Mr. Branch: I didn't hear that statement. May I have it read?

A (Repeating) The outdoor substation of the C. L. & P. Company at Bristol and the synchronous condenser and all auxilliaries therefore are facilities for transmitting Massachusetts energy to Bristol. This outdoor substation includes two three-winding step-down transformers, 66 k. v. to 13.8 and 4.6 k. v., the oil-circuit-breakers and disconnect switches for the control thereof, lightning arrestors, current transformers, and so forth, as well as the steel structure carrying the conductors.

Certain facilities on the Bristol switchboard, operated by the C. L. & P. attendant, used to operate oil breakers on Bristol Mountain at the Bristol tap on the C. P. 1 and C. P. 2 lines are included.

The 2.4 k. v. bus of The Torrington Electric Light Company and the C. P. Company's synchronous condenser connected to that bus in the Torrington substation.

Furthermore, as to the extent that they are used to improve the power factor of the load carried by the 27.6 k. v. line from Torrington, the Robertsville units and the 4.6 k. v. line from that station to Winsted also are facilities for transmitting [*1613*] Massachusetts electric energy to Winsted.

The 4.6 k. v. lines and the 13.8 k. v. lines connected to the Bristol 66 k. v. step-down transformers, as far as located within urban Bristol, and the 4.6 k. v. lines connected to the 27.6 k. v. step-down transformers in Winsted, as far as they are located within urban Winsted, and prior to July, 1939, the low tension lines supplied from the 13.8 k. v. lines at East Hampton, the 4.6 k. v. lines at Colchester and Leesville, together with all the house transformers and equipment for each of these, are and have been since 1935 facilities for the distribution of electric energy from Massachusetts.

These distribution facilities also include as a certain part thereof, the facilities for local distribution for the respective localities.

Mr. Branch: I ask that the answer be stricken out in so far as the witness characterized certain facilities as facilities for transmission of Massachusetts energy. It seems to me that that is a legal conclusion and that it is not proper. It does not seem to me that it was responsive to the kind of question which I understood it to be.

Trial Examiner: I think it is understood that the witness is speaking from a physical standpoint, and I see no reason why it is not permissible. The motion is rejected.

By Mr. Wahrenbrock: *Q* Referring particularly to the Winsted District of The [*1614*] Connecticut Light and Power Company, will you describe those facilities with somewhat greater particularity? *A* Beginning at the 4.6 k. v. bus in Winsted sub-station, and continuing to the source of energy, the following transmission facilities exist, exclusive of the transmission facilities of the Robertsville plant, which I have already discussed. Leads from the 4.6 k. v. bus to the 27.6 k. v. transformers and all instruments and appurtenances used in control of the line, the measurement of its energy, the step-down transformers, the 27.6 k. v. transmission line, the step-up transformers at the Torrington sub-station and the leads to the 2.4 k. v. bus of The Torrington Electric Light Company, and any instruments and appurtenances used in connection with the control of the line; also The Connecticut Power Company's step-down 66 k. v. transformer and the synchronous condenser and appurtenances, the 66 k. v. tap on The Connecticut Power Company's C. P. 1 and C. P. 2 lines. I will add the line-taps and step-down transformers serving the gravel operation near Burrville, which is a minor transmission terminal.

Trial Examiner: Just a moment. I think counsel has something to ask. Do I understand counsel's objection to these questions to be based upon the fact that the statement is made in the language of the Act?

[*1615*] Mr. Branch: The statement is made as characterizing them as transmission facilities for Massachusetts energy, which

seems to me to be an obvious attempt to have this witness say that certain facilities are, in effect, facilities for transmission of electric energy in interstate commerce, and I don't think that is proper.

Trial Examiner: I think the witness may state what the facilities do.

The Witness: I used the terms in the ordinary sense of the terms.

Trial Examiner: Do I understand you to mean that you used them in the sense that they are facilities which do transmit?

The Witness: For the conveyance or transportation.

Trial Examiner: I think with that understanding the testimony is admissible and does not constitute any legal conclusion. Is there any further question on the part of counsel?

Mr. Branch: Well, sir, I make a motion to strike it out. I don't know whether counsel for the Commission offers it solely with the understanding that you have, sir. I wish he would so state.

Mr. Wahrenbrock: Mr. Examiner, this line of questions is designed to bring out the physical description of the facilities and the functions served by them as part of the system which is [*1616*] being described. I propose to show further with respect to the concepts which are here being anticipated by respondent's counsel, the questions that are being anticipated—

Trial Examiner: You are not attempting to obtain any legal statement from an engineering witness, as I understand it?

Mr. Wahrenbrock: No, I desire him to state the engineering function, the electrical function, being served by these facilities.

Mr. Branch: I think he ought to leave out anything about Massachusetts because it seems to me that is a legal conclusion or a conclusion of purpose of the people who maintain them and which does not appear—

Trial Examiner: I don't think it necessarily is. I do not so understand the situation. With that understanding, as we now have it, the motion to strike is rejected.

Mr. Branch: Of course I have an exception.

Trial Examiner: The exception will be noted.

By Mr. Wahrenbrock: *Q* What function is served by the facilities owned and operated by The Connecticut Light and Power Company? Perhaps I should more accurately ask you what function was served by the facilities owned and operated by The Connecticut Light and Power Company from the substation of The Torrington Electric Light Company in Torrington, Connecticut to the low-voltage bus in the Winsted substation of The Connecticut Light and Power Company [*1617*] at Winsted?

Mr. Branch: I don't think it appears that this witness is sufficiently familiar with the history of what was done to answer.

Trial Examiner: What was the testimony of the other witness in that regard which this witness heard?

Mr. Wahrenbrock: During the period covered by Mr. Miller's study.

Mr. Branch: Well, I don't think this was so, to answer your question.

Trial Examiner: I do not recall such testimony. It may be that the witness is familiar with it, but I don't think it has been brought out.

Mr. Wahrenbrock: I don't understand the question.

Trial Examiner: I say I don't think the witness's familiarity with these particular facilities has been brought out. I don't believe they were described by Mr. Miller in detail.

By Mr. Wahrenbrock: *Q* Mr. Thomas, will you state for the benefit of the record the study you have made of the data with respect to these facilities, and of the facilities? *A* I have already given some detail on that subject. I will repeat that I have seen many of these facilities personally. I have had access to and have studied the maps provided by the companies owning them, to become familiar with the character [*1618*] and location of these facilities and I have also had a very good working knowledge of the transmission systems in Connecticut.

Trial Examiner: Does that apply particularly to the facilities referred to in this last question on which the question has arisen?

The Witness: Yes.

Mr. Branch: I object. It seems to me—on that question I am not questioning the gentleman's statement, you understand, but it seems to me that the general kind of a knowledge that an outsider would have would not necessarily be sufficient.

Trial Examiner: He states that he has studied various reports and material submitted by the company, as to just what he studied, that may be brought out in cross examination, if counsel feels that that is necessary. The witness has stated his familiarity, and you may proceed. The objection is overruled and an exception will be noted. Do you have the question in mind?

The Witness: I think so. The transmission or conveyance of the electric energy purchased from The Torrington Electric Company at Torrington to the Winsted 4.6 k. v. bus for distribution in Winsted.

By Mr. Wahrenbrock: *Q* Did those facilities serve any function of local dis- [*1619*] tribution? *A* No. I have in mind that near Burrville the gravel quary purchases three-phase energy for its operation at 440 volts, this energy being taken from the 27.6 k. v. line, which passes nearby. Special step-down transformers are provided by the C. L. & P. Company. This is an isolated industrial customer, who happens to be fed from the transmission line and the 440 k. v. lines do not constitute local distribution, for there is but a single customer.

Q Did I misunderstand you or did you say 440 k. v.? *A* I think perhaps I did. It should be 440 volts. "K. v." should be "volts".

Q What facts corroborative of the opinion which you have just expressed did you observe in your study of those facilities? *A* I will call attention to the fact that for some distance out from Winsted the 27.6 k. v. line carried a 4.6 k. v. distribution circuit for supplying local customers. Thus, one circuit is used for transmission and another, on the same poles, for distribution.

Q Will you explain the meanings and definitions of transmis-

sion and local distribution, as those terms are used and applied by persons particularly engaged or interested in the design, construction, operation or maintenance of electric utility systems?

[*1620*] Mr. Branch: I object to that. It seems to me that this is very similar to the questions which were asked and objected to of a witness whom I called who was familiar with this matter and your Honor ruled that the questions were improper.

Mr. Wahrenbrock: Mr. Examiner, I would like to be heard on that.

Trial Examiner: You may be heard on it.

Mr. Wahrenbrock: I think the Examiner will recall that in making my objection I objected that the purpose for which the term was used was not specified in Mr. Branch's question or request for a definition or an expression of meaning. I have here in my question carefully indicated the purpose for which the term is used.

Trial Examiner: Will you restate that so we have it definitely in mind?

By Mr. Wahrenbrock: As those terms are used and applied by persons particularly engaged or interested in the design, construction, operation or maintenance of electric utility systems.

Mr. Branch: May I remind you, sir, that my questions were very broad, so as to include all purposes, and not merely the one or the ones which have been designated, but in spite of that, objection to the question was sustained.

Mr. Wahrenbrock: That was the vice of the question. It did include all purposes, without differentiation.

[*1621*] Trial Examiner: I think this clearly shows that it is not intended as an interpretation of the Act or a matter of regulation, and I think that the statement requested by respondent's counsel from the witness was so broad as to include conclusions as to the intent of the language of the Act. For that reason, and with the understanding that this is taken only in that narrower sense, the witness will be permitted to answer. Exception will be noted. You may proceed. *A* Before answering the question,

I will explain that the terms "transmission" and "distribution" in electric utility systems, like other broad terms, may be used in a number of different relations and for different purposes, so that no single definition can be drawn for either term that will be consistent and useful in all cases.

For example, where the superintendent of a utility system is organizing his maintenance crews, he well may designate them as transmission crews and distribution crews. In this case he probably will divide the maintenance work between them according to the tools they would use and the particular skills required.

The distribution crew would work in the urban area where lines are on sidewalks and pole-transformers are used, and no heavy line work is done, while the transmission crews would naturally handle cross-country work, which is of a different character.

[*1622*] Another example: In setting up a system of books for a utility there would naturally be accounts for distribution and others for transmission. The items to be assigned to each would depend on what information the auditor wished to obtain or regulating commissions might require. This would obviously not be the same break-down as used by the superintendent of the line crews.

Again, in examining the operations of the system functionally, to analyze the facilities, to determine what facilities contributed to the principal functions, the terms "transmission" and "distribution" would naturally be used, and a study may be made to distinguish which facilities specifically contribute to the function of transmission and which to that of distribution.

A complication enters, in that certain of the structures in the system serve both functions at the same time, in varying degrees.

With this explanation, I will define the terms "transmission" and "distribution", in their functional sense, as outlined above in my answer.

The transmission of energy in a utility system is the conveying of the energy in bulk from a point at which it is available to a

point at which it is needed. Its significance is transportation or conveyance.

Distribution of energy in a utility system is a subdividing [*1623*] of the bulk energy delivered to a neighborhood, among the various consumers. Local distribution narrows the operation down to a group of consumers so closely associated as to use common distribution facilities without the necessity of considering the element of transmission between members of the group.

Transmission facilities are characterized by the search for low energy losses and economy of structural costs; local distribution by the convenience of customers and of the public and the general necessity of accommodation to many structural limitations due to the use of public rights of way, private yards, esthetic considerations, and so forth.

In cases where both functions are served by the same facilities, it is considered that a facility is a transmission facility, as long as a material part of its utility as measured by the requirements of design depends upon transmission of energy where distance is an obstacle.

By Mr. Wahrenbrock: *Q* What kinds of distribution other than local distribution are there, if any? *A* Primary and secondary distribution, perhaps others.

Q Will you explain? *A* When the service areas of electric utilities, as is usually the case, have two dimensions, a single transmission line is not particularly well adapted.

[*1624*] Trial Examiner: Will the witness explain what he means by "two dimensions"?

The Witness: I am thinking of the length and width of an area or field. I will state the answer again. When the service areas of electric utilities, as is usually the case, have two dimensions, a single transmission line is not particularly well adapted to transport to all sections of the area, each its allotted block of power.

It is often found desirable to make use of branch lines from various points on the main transmission line to make bulk deliver-

ies to particular territories. There is a sense in which this is distribution, even though the chief purpose is the overcoming of distance. Such a combination of transmission and distribution may be called sub-transmission or primary distribution, and is characterized by the use of line voltages approximating those of transmission. It still remains transmission, functionally speaking.

Again, where closely grouped ultimate consumers extend over considerable areas, as in large cities, the quantities of power to be delivered in one locality become important and distance enters into it as a material element. In such cases short supplementing lines are introduced to reduce losses and strengthen the service. These may be called secondary distribution.

[*1625*] Applying these definitions of distribution, it will be found that no two utility systems are alike and a certain flexibility must exist in the definition of the term "distribution".

[*1626*] *Q* Will you please explain what you mean by certain facilities serving a transmission or a local distribution function? *A* By the term "function", I have in mind the objective or plan of the designer of the line who must consider what purposes he wishes to accomplish, and what means he has at his disposal. In this functional analysis of facilities, the actual purpose of the design will guide as between transmission and distribution.

Q In the light of the explanations you have made, are the facilities owned or operated by The Connecticut Light and Power Company from The Torrington Electric Light Company substation at Torrington, Connecticut, to the low voltage bus in The Connecticut Light and Power Company substation at Winsted, facilities for the transmission of electric energy as distinguished from the local distribution of electric energy?

Mr. Branch: I object. I think—

Trial Examiner: I think the witness should be asked whether it is his opinion that they are.

Mr. Branch: I think certainly if the question is permitted, it is understood that this has no bearing on the interpretation of the Act, and unless it has such a bearing, it seems to me immaterial.

If it has such a bearing, it seems to me improper under your Honor's ruling.

[*1627*] Trial Examiner: I think it should be limited to the opinion of the witness.

Mr. Wahrenbrock: If there is anything more than that involved, as a result of Mr. Branch's objection, I would like to be heard.

Trial Examiner: You may be heard as to anything you feel may be involved.

Mr. Wahrenbrock: May I have Mr. Branch's statement read, please?

(Whereupon the statement as above recorded, was read by the reporter.)

Mr. Branch: I object on the grounds I have specified.

Mr. Wahrenbrock: I cannot admit that it has no bearing upon the interpretation or the application of the Act. I am perfectly willing to have it qualified in the witness's opinion.

Trial Examiner: With that understanding, that it will be reworded to make it a matter of opinion of the witness, we will proceed. I suggest that you first reword the question.

By Mr. Wahrenbrock: *Q* Mr. Thomas, in the light of the explanations you have made, in your opinion are the facilities owned or operated by The Connecticut Light and Power Company from The Torrington Electric Light Company substation in Torrington, Connecticut, to the low voltage bus in The Connecticut Light and Power Company substation at Winsted, Connecticut, facilities for [*1628*] the transmission of electric energy as distinguished from the local distribution of electric energy?

Mr. Branch: Well, I think it also ought to be qualified as to merely an engineering matter, or for what purpose.

Mr. Wahrenbrock: The question limits it to the explanations he has made.

Trial Examiner: I think with that in view it is understood that the expression "in his opinion" means his opinion as an engineer, and with that understanding the objection of respondent's counsel will be overruled. The witness may answer the question.

Mr. Branch: And may I note an exception?

Trial Examiner: The exception will be noted.

The Witness: Yes.

By Mr. Wahrenbrock. *Q* In so far as the energy so transmitted has been shown by Mr. Miller to be transmitted from Massachusetts and consumed at points in Connecticut, in your opinion are those facilities facilities for the transmission of electric energy which is transmitted from Massachusetts and consumed in Connecticut by persons other than transmitters thereof?

Mr. Branch: It seems to me that is clearly objectionable. It is an attempt to get through this witness something in the nature of a legal conclusion.

Trial Examiner: Will you read back the question?

[*1629*] (Whereupon the last question as above recorded, was read by the reporter.)

Trial Examiner: With that in view, will you restate the objection?

Mr. Branch: Yes, sir, I will restate it. I object to it on the ground that this apparently has no purpose other than to obtain from this gentleman something in the nature of a legal conclusion. That is particularly apparent in that the question contains certain language about "the transmitter thereof", which is somewhat ambiguous language perhaps appearing in the Act itself. He is just trying, by substituting the word "Massachusetts" for "interstate", it seems to me, to have the witness state that these are facilities within the description of the Act. There could hardly be a closer resemblance between the language of the Act and the question than this. I object on those grounds.

Trial Examiner: Do I understand the objection is a quotation of a part of the Act in the question?

Mr. Branch: In substance, yes, sir.

Trial Examiner: I would like to have counsel state just what part of the Act.

Mr. Wahrenbrock: Mr. Examiner, I am perfectly willing to concede that the language in my question does parallel some

language in the Act. I am not asking for a legal conclusion. I am asking this engineer for a statement of engineering facts, [*1630*] in the light of the explanations of the meaning of the terms which he has just given—whether, as an engineering factual question, his conclusion is as I have asked.

Mr. Branch: May I make a statement, sir?

Trial Examiner: Yes, you may.

Mr. Branch: The Act provides that the provisions of part 2, and I now quote, "shall apply—"

Trial Examiner: What section?

Mr. Branch: Section 201-B, "apply to the transmission of electric energy in interstate commerce". Then I skip—they shall not apply, or—it says, "The Commission shall not have jurisdiction except as specifically provided in this part", and the part next following, and now I quote, "Over facilities used for the generation of electric energy, or over facilities used in local distribution only, or only for the transmission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter."

It is quite clear that the language used in this question is very close to the language in the Act, substitute for "interstate commerce", "Massachusetts energy", or something of that kind. But otherwise, it is almost verbatim the same.

Trial Examiner: I think that the language is sufficiently qualified by the previous statement of the witness that it is shown to be a matter of his engineering opinion and, certainly, [*1631*] in any event, the Examiner will not be placed in the position of taking any legal opinion into consideration if it should appear in any way to be an opinion as to law.

The objection is overruled. The witness will answer the question.

The Witness: Yes.

By Mr. Wahrenbrock: *Q* Directing your attention to the transformers to which you referred at Winsted, at The Connecticut Light and Power Company substation at Torrington, at The Tor-

rington Electric Light Company's substation at Torrington, or the substation of The Connecticut Power Company at Torrington, and to the transformers at the South Meadow substation at Hartford, will you describe the functions performed by those transformers? *A* To explain the operation of the particular transformers to which your question relates, it will be necessary, first, to make a few statements about electric power transformers in general. I will begin by explaining the nature of the magnetic action and counter E.M.F. in the electro magnet as used with alternating currents.

The simplest form of such electro-magnets consists of a magnetic core of iron, in the form of a laminated ring, or a hollow square, with a coil wound around and encircling the core. When excited by alternating current, the core is the seat of [*1632*] a continuously alternating magnetism. The strength of the magnetism varying exactly in correspondence with the strength of the alternating exciting current. The coil is known as the exciting coil for the magnet.

The pattern of the alternating magnetism in the core is a series of impulses, each consisting of a rising, followed by a falling value in one direction, in turn followed by another similar impulse, with rising and falling values in the opposite direction. An impulse in either direction is called an alternation, and a pair of alternations, one positive and one negative, is called a cycle. All cycles are alike as long as the exciting current is unchanged.

Since in any electric magnet the magnetism in the core must correspond to the magnetizing or exciting current, a proper E.M.F. must be applied to the primary coil to produce this current. The alternating magnetism thus requires an alternating exciting current, and an alternating applied E.M.F.

Now, in exciting an electro-magnet in the above manner, it is observed that an opposition to the applied E.M.F. occurs in the exciting coil, tending to oppose the flow of the magnetizing current. Observation further shows that this opposing or counter E.M.F., as it is usually termed, is at each instant of time exactly

proportional to the rate of increase or decrease of the magnetism in the core. To produce the exact pattern of change desired in the magnetism, it is necessary to [*1633*] apply an E.M.F. to the primary just equal to this counter E.M.F. Or, to look at the matter in another way, when an alternating E.M.F. is applied to an electro-magnet, the pattern of the change in the magnetism will automatically adjust itself so that the counter E.M.F. will exactly equal the applied E.M.F. This follows since neglecting the resistance of the windings there is nothing else to resist the flow of current, due to the applied E.M.F. This is a very significant feature.

To summarize, it has now been shown that when an alternating E.M.F. is applied to an electro-magnet, the effect is to produce a flow of exciting or magnetizing current of such a magnitude and such a pattern that the counter E.M.F. generated by the core, and acting opposed in the primary circuit, will always just equal the applied E.M.F. neglecting losses.

I will now consider the observed behavior of a transformer, which in its simplest form is nothing but an electro-magnet with a closed magnetic core, but with two separate one-turn coils wound thereon, in place of one. The core, as with the alternating current of the electro-magnet carries an alternating magnetism of the same special pattern. The coil used to magnetize or excite the core is called a primary coil. This is the basis on which the practical transformer designer works. But now, since the primary coil may, broadly speaking be placed at any point on the core, and since it has no actual contact with the core, the same counter E.M.F. would be ex- [*1634*] pected to appear in both of the two coils wound on the transformer coil, for the core has no way of distinguishing one from the other. Such is the observed fact. The same counter E.M.F. will appear in all one-turn coils wound on the same excited core.

It should be pointed out, however, that while the so-called counter E.M.F. is, in fact, directed to oppose the applied E.M.F. in the primary coil, there is no E.M.F. applied to the second coil,

and the counter E.M.F. is not a counter E.M.F. in that coil, but a straight electro-motive force. It may be used as any other electro-motive force to produce current flow in any appliance connected to the terminals of the coil. Thus, by the use of two coils and a core, it is possible to reproduce in a second coil the E.M.F. applied in a primary circuit, not conductively connected with the second circuit, the second E.M.F. being available for practical use. The E.M.F. and any current in the second coil are called secondary E.M.F. or secondary current.

But one important matter must be noted. When advantage is taken of this opportunity to use the secondary voltage by connecting it to an electric appliance, current will then flow in the secondary in the usual way in electric circuits. This current will have an effect on the magnetism in the core, or will tend to, since any current in a coil wound around the core will act as an exciting current. This tendency is [*1635*] directed to oppose the change in magnetism in the core which produced the counter or secondary E.M.F. of itself.

It should be remembered that the exciting current in the primary has adjusted itself so that the pattern, of changes in the magnetism will give a counter E.M.F. exactly equal to the applied.

The secondary current is thus a disturbing factor. The transformer, however, takes care of this disturbing factor very easily, by merely increasing the current in the primary just enough to neutralize the opposing effect of the secondary current on the magnetism in the core. That is, every flow of current in the secondary coil is simultaneously accompanied by an increase of flow in the primary, just equal to the secondary current and opposite in direction around the core.

Obviously, the exciting current in the primary, and the strength of the magnetism which must correspond thereto, is unchanged, since the tendency of the secondary current to reduce the magnetism is just balanced by the opposing tendency of the increase in the primary current. It is thus true that the magnetism of the core, or the magnetic flex, as it is usually termed, does not change mate-

rially with changes in load, even with changes from full load to no load.

I will also state that in commercial power transformers, the amount of energy stored in the magnetic core at the time of highest magnetization is but a very small fraction of the [1636] amount of energy transferred from the primary to the secondary in one alternation.

Trial Examiner: I might verify one point, Mr. Thomas. Do I understand that the e.m.f., or electro motive force is the product of the voltage by the amperage?

The Witness: No. The electro motive force is the pushing force, as a result of which current will flow in a circuit. But when you come to find out how much energy has been expended in producing that flow, you will multiply the electro motive force by the current.

Trial Examiner: Multiply the electro motive force by the current or the voltage?

The Witness: The electric motive force and the voltage are the same thing.

Trial Examiner: All right. That clarifies that point. I am a little rusty on some of these things.

The Witness: It is now seen, as is observable in the actual operation of the transformers, that e.m.f. is available in the secondary of the exciting transformer, and when current is taken from there that an exactly equal current corresponding appears in the primary coil, and since the e.m.f. is the same in both coils, each having a single turn, an amount of electric energy equal to the amount of energy taken out in the secondary must be simultaneously supplied to the primary.

By Mr. Wahrenbrock: If you will permit an interruption, [1637] Mr. Thomas, I am not sure I properly understood you. In the beginning of that last sentence, did you say—did you refer to an exciting transformer or to an excited transformer?

The Witness: Excited—e-x-c-i-t-e-d.

Trial Examiner: Not in the vernacular sense of the word, I presume.

Mr. Wahrenbrock: They may be exciting before we get through, Mr. Examiner.

The Witness: This is the operation of a transformer, transferring energy from one form to another. It is of the greatest practical importance. But the mode of operation of the transformer permits the securing of another all-important advantage. While the above described elemental power transformer has only two one-turn coils, the common power transformer has many primary and many secondary turns, each of which is energized with its own e.m.f., just as do the one-turn coils I have been discussing. Obviously, if a high voltage is desired in the secondary, many secondary turns may be connected in series, the same current passing through all the coils, and each coil adding its e.m.f. to that of all the others, as a result, producing a high total e.m.f. In other words, the electric energy having been supplied to the secondary turns, these turns can be connected so as to produce a higher voltage than the primary e.m.f. This is called a series connection. It is the same expedient as is used in getting a high enough [1638] voltage in a battery of dry cells to operate a six or a twelve volt lamp, or for the commercial two or three cell automobile starting battery, and for getting transmission line insulation of sufficient resistance to support very high voltages, and is available for innumerable uses.

I recall that the famous and very early Thury transmission system in Europe, making use of constant current, obtained a high transmission voltage by connecting separate generators in series, just as transformer turns are connected in series.

On the other hand, if the secondary voltage of a single turn coil is high enough for the circuit requirements, and a large current capacity is desired, the several secondary coils may feed in parallel or in multiple into the secondary circuit, each coil contributing its bit of current to the total current.

The terms "parallel" or "multiple" relate to the system of con-

nections in which a total entering current divides between several pairs, no element of current passing through more than one path. Obviously, this juggling of turns may be applied to the primary as well, to adapt the primary coils to fit that particular applied e.m.f. that happens to be available.

The principle of combining primary and secondary turns in various ways has a wide range of flexibility, and it is the business of the designer to make the most-efficient adjustment for any particular case in hand.

Since the expedient of combining of secondary turn can [1639] be availed of, only after the energy has been delivered to the secondary, the action of the transformer in transferring energy from one coil to another is in no way affected.

As a practical matter, it is the fact that primary and secondary turns may be differently combined to give different primary and secondary voltages,—I am not sure how I stated that. May I repeat?

As a practical matter, it is the fact that primary and secondary turns may be differently combined to give different primary and secondary voltages that gives the power transformer its greatest utility.

Referring now to the transformer of your question, and their functions, I will explain that the 27.6 k.v. transformers at Winsted receive the energy from the transmission line from Torrington and deliver it to the 4.6 k.v. bus at Winsted substation, thus being a link in the chain of transmission from Massachusetts to Winsted. The action of these transformers is as I have just described for power transformers.

The energy received in the 27.6 k.v. primary is delivered to the 4.6 k.v. secondary. The number of turns in series in the primary winding is adjusted to the transmission line voltage, and the number of turns in series in the secondary, to the 4.6 k.v. distributing e.m.f. circuit.

Please strike out "e.m.f". "Distributing circuit".

"The 27.6 k.v. step-down transformer at Torrington serves

[*1640*] similarly to pass the electric energy received from the Torrington Electric Company in the 2.4 k.v. circuit to the 27.6 k.v. transmission line.

These transformations are practically instantaneous, and with very small losses.

The 66 k.v. step-down transformers at Torrington receive the energy from The Connecticut Power Company, 66 k.v. transmission line, and deliver it to The Torrington Electric Light Company 2.4 k.v. bus, the buses from which The Connecticut Light and Power Company obtain energy for Winsted.

The only other transformers in the path of the energy flowing from Massachusetts to Winsted prior to about March, 1941, the time of the change of the voltage of the line D-4, are the two auto-transformers at the outdoor substation of The Connecticut Power Company at South Meadow. These serve, each in its own circuit, for conveying the energy coming from Agawam in the 66 k.v. circuit to the 66 k.v. Connecticut Power Company bus, all at South Meadow.

At the same time, the transformer adjusts the line voltage of the Agawam line to suit the requirements of the CP1 and CP2 lines.

Mr. Branch: I move that there be stricken from that response all references to such things as "these transformers constitute a link in transmission of energy from Massachusetts to Winsted", and similar expressions. I think, in regard [*1641*] to other transformers, it seems to me that is not responsive to the question, and that it is improper, and it is an attempt to put in something to characterize what may be the legal effect or the subjective purpose of these transformers.

Trial Examiner: I understood the witness to mean that is the physical effect. Now, with that in view, I see no reason why this should be stricken, and the motion to strike is rejected. We have now reached a period a little past the middle of the afternoon, and we will take a five-minute recess.

(At this point a short recess was taken, after which the hearing was resumed.)

[*1642*] Trial Examiner: The hearing will now be in order.

By Mr. Wahrenbrock: *Q* Mr. Thomas, having referred to the auto-transformers in the South Meadow substation, will you explain the action of those auto-transformers and if it is convenient to do so, refer to any diagram you may have? *A* Any common power transformer of the proper design may be connected to serve as an auto-transformer. With this statement, further explanation of this auto-transformer action will be given.

The auto-transformer is usually made use of only when a minor change in line-voltage up or down is to be effected. When the auto-connection of a transformer is made us of, instead of following the usual two-coil method of feeding the delivery circuit from the secondary of a transformer whose primary is fed from the supply, use is made of a smaller transformer which acts to add to the supply the additional amount of voltage necessary to increase the voltage from the supply-circuit up to the voltage required in the receiving circuit.

I will explain this auto-transformer principle, which is only a special application of the two-coil transformers in normal operation by referring to a rough sketch, which I produce.

Mr. Wahrenbrock: I hand the reporter, for identification as Exhibit No. 63, the sketch referred to and hand respondent's counsel and the Examiner copies thereof.

Trial Examiner: Respondent's counsel has had an opportunity [*1643*] to see it? I don't think it takes long to look at it. It will be marked as Exhibit No. 63 for Identification.

(Document referred to was marked as Exhibit Number 63 for Identification.)

Trial Examiner: I presume this copy is made with an indelible pencil?

Mr. Wahrenbrock: The copy you have is a carbon copy of a pencil sketch. The original is a pencil sketch.

Trial Examiner: Yes.

The Witness: In this sketch the primary coil and the secondary coil of an ordinary two-coil transformer are shown. The leads of the primary are shown and the leads of the secondary similarly. The problem is to provide from the lower voltage-supply circuit shown a higher voltage for the receiving circuit shown. The design of the transformer is such that the secondary voltage is just equal to the difference in voltage between the receiving and the supply circuits.

With the connections in the sketch it is clear that current passing from the left hand wire of the supply circuit, marked "1" will traverse the secondary of the transformer and that in that winding there will be added enough voltage to that already available in the supply circuit for the total to equal the voltage required in the receiving circuit.

If now there is energy to supply the primary winding and a circuit to excite it, the operation is complete. As shown, [*1644*] the primary leads are connected to the supply leads "1" and "2" which provides both excitation and energy in the usual way.

I have marked with arrows on the face of the sketch the course of the current through the primary and secondary windings, and in the receiving and supply circuits.

Thus the size of the transformer need be only great enough to raise or lower the voltage by the difference in the voltages between the supply and the receiving circuits. If this difference is only ten or fifteen per cent of the supply voltage, the advantage of having to build a transformer for only ten or fifteen per cent of the total energy is obvious.

The auto transformers at South Meadow, connected to the 66 k.v. lines from Agawam to the 66 k.v. bus at the same point are of this sort.

Observation will show that the only action necessary to change a two-coil ordinary power transformer to an auto-transformer is a connection between one of the primary leads and the proper secondary coil lead. This connection may be made either outside or inside the transformer. It is usually made inside.

Q What is the approximate loss of energy in such transformers; under normal operating conditions? *A* Usually less than 2 per cent when the transformers are [*1645*] reasonably well loaded. The losses due to magnetism in the core which is fully excited at all times, cause a greater percentage of loss when the load on the transformer is light.

Q Will you please state how electric energy may be defined? *A* The electric energy is energy being conveyed in an electric circuit. Its amount at any instant may be measured by the product of the current and the e.m.f.

Q Aside from the losses to which you have referred, is there any difference between the amount of electric energy which enters each of those transformers and the amount which leaves it? *A* No, excluding the exciting energy supplied through the primary winding.

Q I am not sure that I have made my statement sufficiently clear to indicate whether the reply you have given applies only or particularly to an auto-transformer, or to power transformers generally. I will therefore repeat the question to ask what is the approximate loss of energy in power transformers under normal operating conditions? *A* The same answer.

Q And aside from the losses to which you have referred, is there any difference between the amount of the electric energy which enters a power transformer and the amount which leaves it? *A* No, considering my exception of the exciting energy.

[*1646*] *Q* How much does this exciting energy amount to? *A* Substantially negligible, about one per cent compared with a full load operation.

Q Is it possible for any different amount of electric energy to enter a primary coil of the ordinary power transformer than that which leaves the secondary coil thereof—

Mr. Branch: Excuse me. I didn't understand that. May I have it read?

Mr. Wahrenbrock: May I complete it?

Trial Examiner: Will you read the answer back? Was your question completed?

Mr. Wahrenbrock: No, I was interrupted before I could complete it.

Trial Examiner: Permit counsel to complete his statement and then we will have the whole question read back. I think that will be simpler.

By Mr. Wahrenbrock: *Q* —that which leaves the secondary coil, aside from such relatively small transformer losses and exciting energy?

Trial Examiner: Will you now read the question back for the benefit of respondent's counsel.

(Question read by reporter.)

Q Will you answer the question now, Mr. Thomas? *A* No.

Q And that is your reply to the question, is it? [*1647*] *A* Yes.

Q Is there any appreciable delay or difference between the time electric energy enters the ordinary power transformer and the time it leaves it, neglecting the exciting energy? *A* No.

Q Is it possible for electric energy to leave a transformer, an ordinary power transformer, at any substantially different time than it enters it, in commercial quantity excluding the exciting energy? *A* No.

Q Is any of the electric energy which enters any of those transformers, the ordinary power transformer, ever stored for anything more than a very small fraction of a second, at most, excluding exciting energy in the power transformer? *A* No. The energy stored in the core, however, goes in and out twice every cycle, or every sixtieth of a second.

Q And is that energy to which you have last referred, the exciting energy? *A* Yes.

Q Would the storage of electric energy for any substantial period of time in commercial quantities be possible in the ordinary power transformer? *A* No.

[*1648*] *Q* Will you please state how voltage and current may

be respectively defined? *A* Voltage is that thing which can be introduced into an electrical circuit and cause current to flow against resistance. It is not technically a mechanical force, the same as the force of gravity, but it has the ability to cause current to flow around a circuit. Current is the flow of electricity in an electric circuit, it is the flow in a conductor resulting from being subjected to the influence of voltage. An electric current manifests itself by its magnetic effect, by heating conductors, by the development of a mechanical force when placed across a magnetic field by the deposition of metals, and so forth.

Q Will you explain what differences there are, if any, between the primaries and the secondaries of ordinary power transformers in voltage and current in normal operations? *A* Taken turn by turn, and neglecting the excitation of the core and losses, there is no difference between the primary and secondary.

Q When a power transformer has been designed and constructed, with the primary and secondary winding, suitable to give a prescribed ratio of primary and secondary voltages, would it be necessary to redesign or reconstruct the transformer, to secure a different voltage ratio? [*1649*] *A* No, it would be sufficient merely to reconnect the primary or the secondary turns both, so as to change the number of turns in series.

Mr. Branch: I am sorry, there was so much noise that I lost some of both the question and the answer. May I have them read?

Trial Examiner: The question and answer will be read back for the benefit of respondent's counsel.

(Question and answer read.)

By Mr. Wahrenbrock: *Q* Are power transformers commonly so designed as to permit ready change of the number of turns in series? *A* Yes. In most localities 110 volts is used for local consumption, and in many others 220 volts, and in some, both voltages. As a great convenience to users and manufacturers, standard transformers are built to supply either voltage. The change from 110 to 220 volt delivery in such a transformer is made by connecting in series two coils that have been operating in paral-

lel for the 110 volt use. Provision is made for making convenient reconnection outside the case. There are many other instances of transformers in which a change of connection is made outside the case.

Q Could a similar change in ratio between primary and secondary e.m.fs. be secured in any other way? *A* Yes, two similar transformers connected with primary [*1650*] coils in parallel, and their secondary coils in parallel will give a certain appropriate ratio between primary and secondary e.m.f. If now the secondary coils of the two transformers be connected in series, with the primaries still in parallel, the secondary voltage and voltage ratio of the pair will be doubled. This is analogous to the increase in ratio by reconnecting the secondary turns in series in a single transformer.

Q Are the changes in voltage and in current, which are obtained by the manner of connecting the turns of the primary and secondary, changes of such a nature that the voltage and current in the secondary circuits cannot subsequently be changed back to the original voltage and currents or to any other voltage and current commonly in use? *A* The voltages and currents in an electric circuit can be changed up or down at various points, as may be desired, but the current and voltage changes will, of course, always be in inverse ratios.

Q By "inverse ratios" you mean in inverse ratios to each other? *A* As the voltage goes up the current goes down.

Q What facilities would be necessary to accomplish such a further change in voltage and current? *A* Other transformers.

Q And would such transformers function in substantially [*1651*] the same way as those you have already described? *A* Yes.

Q Is there anything about the operation or function of any of these transformers, to which you have referred, at Hartford, Torrington and Winsted, which prevents a further change, or any number of further changes of the voltages and current to any voltage and current which may be desired in connection with the

further transmission or utilization of the electric energy for any of the common purposes within the limits of the capacity of the system to supply the necessary amount of electric energy? *A* No. Neglecting losses and remembering that voltage and current changes are in inverse ratios, I may point out that after having been stepped up to 66 k.v. at the generating stations, the Winsted energy has been stepped down to 2.3 k.v. and up to 26.7 k.v. at Torrington, before being finally stepped down to 4.6 k.v. at Winsted.

Q I notice that you gave two figures for the voltage on the line between Torrington and Winsted. Do you recall whether it is 26.7 or 27.6? *A* 27.6 I should have read it.

Q You have spoken of energy—

Mr. Wahrenbrock: I will withdraw that.

Q Directing your attention to the instances as shown by Mr. Miller, when electric energy requirements of the Winsted [1652] District were supplied solely from Massachusetts, except in so far as Robertsville may also have been supplying a part of such requirements, will you explain what would happen if any part of the circuit in the Torrington-Winsted line or the transformers at each end of that line should suddenly be removed or fail? *A* The circuit would be interruped, and the flow of energy stopped.

Q If there is a sudden failure in any part of any of the facilities serving the transmission function, what happens to the operation of the rest of such facilities? *A* Normal operation is interrupted.

Q Considering a single typical transmission circuit, is the transmission at every point in the system between the generating facilities and the local distribution facilities continuously dependent and contingent upon the transmission at every other point? *A* Yes. The transmission of power over any electric circuit is necessarily continuous over the whole line. In the absence of a complete circuit, transmission cannot occur.

Q You have spoken of energy flowing or passing along a circuit and have stated that the transfer of energy is practically instantaneous. Can you explain this a little more fully? *A* Assume

a generator on one end of a single circuit [*1653*] and a lamp on the other, with its switch open. Assume further that the generator is operating and the line alive or hot. This means that the generator e.m.f. is striving to pass current around the circuit from the positive terminal to the negative, but that the circuit is interrupted at the lamp. In other words, the generator e.m.f. is transferred to the lamp terminals. When now the lamp circuit is closed, the current starts to flow in the lamp all the way from the generator around the circuit. It cannot flow without the e.m.f. in the generator, nor without the path through the lamp.

Q Directing your attention to the instances shown by Mr. Miller in which electric energy requirements of the Bristol District of The Connecticut Light and Power Company were supplied in whole or in part from Massachusetts, will you please describe the system of facilities by which that was accomplished, in so far as you have not already done so? *A* Energy is distributed in Bristol over both 13.8 k.v. and 4.6 k.v. facilities. The 66 k.v. transformer at Bristol already mentioned is so constructed as to have the two low-tension windings, one supplying 13.8 k.v. and the other 4.6 k.v., and hence is able to supply energy at both voltages. This transformer and this circuit are provided with certain auxiliary equipment for measuring the energy flowing and controlling the circuit, which are necessary for the proper operation [*1654*] of the station.

Furthermore, there is provided a 13.8 k.v. synchronous condenser to assist in maintaining the voltage of the 13.8 k.v. and 4.6 k.v. bus. The synchronous condenser located at the substation is somewhat similar in construction to an alternating generator and serves to relieve the transmission line of lagging current. The effect of this is to greatly reduce the voltage loss in the transmission lines, or which is the same thing, to increase the capacity and reduce the line losses.

This is the principal purpose for the introduction of these and all other such synchronous condensers.

The primaries of the 66 k. v. transformers are connected to the

66 k. v. line tap leading from lines C.P.1 and C.P.2 nearly, this being the path by which energy reaches the Bristol substation.

In further explanation of the action of the synchronous condenser, I may say that the large number of electric motors and similar type of appliances found on utility distribution lines, of which those in Bristol are no doubt a typical example require a large amount of exciting current, somewhat as do the transformers in a system. This exciting current is difficult for a transmission line and step up and step down transformers to handle, and it tends to cause an excessive depression of the line voltage and excessive losses.

[*1655*] A synchronous condenser has the capacity to relieve the transmission lines of this exciting or lagging current and thus serves to reduce the natural loss in voltage and energy.

The synchronous condenser is introduced at Bristol as similar apparatus is at Torrington and Middletown, to facilitate the operation of the transmission lines and the step up and step down transformers.

Q What function is served by the facilities owned and operated by The Connecticut Light and Power Company from the low-voltage buses to the connection of the high line at the substation structure, including the synchronous condenser at Bristol? *A*. The transmission of electric energy.

Q Did those facilities serve any function of local distribution? *A* No.

Q In the light of the explanations you have previously made, in your opinion, are those facilities for the transmission of electric energy as distinguished from the local distribution of electric energy?

Mr. Branch: Well, I object. It seems to me here is an open attempt to get the witness to state an opinion on what is a question of law.

Trial Examiner: I think it should be clear what the nature of the opinion is.

[*1656*] Mr. Wahrenbrock: Mr. Examiner, there is certainly

nothing hidden here. I agree that it is open. As to what kind of an attempt it is, I will say that it is exactly the same question which was previously put with respect to corresponding facilities at Winsted to Torrington. The question raises no issue not raised by the exactly similarly worded question with respect to those facilities.

Trial Examiner: An objection has been raised, and I assume that the witness may be entitled to express an engineering opinion if the question is so worded.

Mr. Wahrenbrock: It was so worded.

Trial Examiner: I believe it is not. I believe the question asks him to express an opinion. If you will state the question in such a way that it clearly appears on the record to be an engineering question, it will be permitted.

Mr. Wahrenbrock: Mr. Examiner, it is qualified in two ways. It is qualified by asking him for his opinion, and it is qualified by the reference to the explanations he has previously given with respect to the meaning of those terms used in the question, as he has defined them.

Trial Examiner: I think it is very simple. The request of the Examiner is that you ask him to express his opinion as an engineer. I see no reason why the question cannot be worded that way.

Mr. Wahrenbrock: If that is intelligible to the witness, I [*1657*] am perfectly willing to so qualify it.

Trial Examiner: Will you word it then? Restate the question.

By Mr. Wahrenbrock: *Q* In the light of the explanations you have previously made, in your opinion as an engineer, were those facilities for the transmission of electric energy as distinguished from the local distribution of electric energy?

Mr. Branch: My objection is noted?

Trial Examiner: The objection is overruled to the question as now stated. You may answer.

A Yes.

[*1658*] *Q* In so far as the electric energy so transmitted was electric energy transmitted from Massachusetts and consumed in

Connecticut by persons other than a transmitter thereof, at the times indicated by Mr. Miller, were they facilities for transmission of electric energy transmitted from one State and consumed in another, by a person other than a transmitter thereof?

Mr. Branch: I object to that, particularly in view—in addition to the other reasons I have stated, that there is injected the words "the transmitter thereof". I don't think it is clear what that means.

Trial Examiner: I would like to hear that stated thoroughly. I would like to study that last part. The reporter will read the question.

(Whereupon the last question as above recorded, was read by the reporter.)

Trial Examiner: I don't see where the clause "other than a transmitter thereof" adds anything to the statement of fact. Will counsel explain in what respect he feels that it does, or that it is material?

Mr. Wahrenbrock: I am trying simply to show the existence of a state of facts to which the provision of the Act apply. Naturally, if I am to come within the terms of the Act, I have to establish the facts to which they apply—to which the Act applies.

[1659] Trial Examiner: I think that can be divided into two questions.

Mr. Wahrenbrock: Mr. Examiner, I submit it can be divided into many questions, but if it is susceptible to being answered in the form given, I would like to have it so answered.

Trial Examiner: I don't think the witness should answer in the language of the statute. I think if it is placed in two questions, that difficulty can be avoided.

Mr. Wahrenbrock: There is no prohibition to have the witness state the facts, if he states them accurately, in a certain language, just because that language happens to be used in the law.

Trial Examiner: The witness may state it was so transmitted. He may state it was transmitted by someone other than—or that

it was used by someone other than the transmitter, but to tie that into one clause, I think it is an attempt to express a legal opinion.

Mr. Wahrenbrock: If it will save time, I will divide the question.

Trial Examiner: I think it will save considerable time.

Mr. Wahrenbrock: I will attempt to do so.

By Mr. Wahrenbrock: *Q* Mr. Thomas, in your opinion as an engineer, in so far as the electric energy so transmitted was electric energy transmitted from Massachusetts and consumed in Connecticut at the [*1660*] times indicated by Mr. Miller's study, were they facilities for the transmission of electric energy transmitted from one State and consumed in another?

Mr. Branch: Well, I think that is a legal opinion.

Mr. Wahrenbrock: It is a legal opinion to state whether in your opinion as an engineer something is true.

Trial Examiner: I think that may be a matter of engineering facts also, or aside from any question of the Act. The witness may answer the question. Your exception will be noted.

The Witness: Yes.

By Mr. Wahrenbrock: *Q* And was the electric energy so transmitted consumed by persons other than a transmitter thereof?

Mr. Branch: Well, I think all that amounts to is a construction of the word "transmitter", which is a word in the Act, and is obviously an attempt to get a legal opinion on the meaning of the Act.

Trial Examiner: I think that is an engineering question and I think all understand what is meant by the term "transmitter".

Mr. Branch: May I note my exception?

Trial Examiner: Your exception will be noted.

The Witness: May I hear the question?

Trial Examiner: The reporter will read the question to [*1661*] the witness.

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: Yes.

By Mr. Wahrenbrock:-*Q* Mr. Thomas, will you describe more fully the part performed by the three-winding step-down transformers in the Bristol substation, the part performed by those transformers in the transmission of electric energy transmitted from Massachusetts? *A* The three winding 66 k.v. to 13.8 k.v., or 4.6 k.v. transformer is a development of the two-winding transformers already described. It has been explained that in an excited transformer, every turn receives the same counter electro motive force. Also, that in a transformer with many secondary turns, these turns may be so combined as to secure either a low voltage secondary, or a secondary with large current capacity. By the same method, it is possible to group the secondary turns into two groups, or secondary coils, not connected metallically.

Further, it is possible to group the turns in each of these two secondary coils differently, so that one coil has a higher voltage than the other, and this has been done in the Bristol 66 k.v. transformer. For every turn in the 4.6 k.v. secondary winding, there will be 13.8/4.6 turns in the 13.8 [*1662*] k.v. secondary, and the e.m.f. in the two circuits will be in the same ratio. I would like to ask the reporter if she understood what I intended to say in putting in an oblique line between the two figures. That indicates that the first number is divided by the second.

Q You were intending to indicate an improper fraction? *A* Yes. By the law of the transformer, any current flowing into a secondary turn of any coil will require an equal current in a primary turn to balance. Flows of current in both of these secondary turns simultaneously require an increase in the primary, equal to the sum of the two secondary currents. Thus, current may be taken from either or both secondaries at any time, and the increased flow in the primary must equal the sum of the two. This is a very convenient type of transformer and is frequently used.

Q What are the approximate energy losses in such transformers under normal operating conditions? *A* These transformers have losses comparable with two-winding transformers. That is usually less than two per cent when fully loaded.

* * * * * * [*1665*]

By Mr. Wahrenbrock: *Q* Mr. Thomas, without repeating the explanation you have given of the nature of the magnetic action and counter e. m. f's. in the electro-magnet as used with alternating currents, and the explanation you gave of the observed behavior of the transformer in its simplest form, and the explanation you gave of the methods of connecting primary and secondary turns, respectively, in order to adjust primary and secondary voltages, will you explain the function of the three-winding transformer at Bristol, to which you have referred, in connection with the [*1666*] transmission of electric energy from Massachusetts?

Mr. Branch: I don't want to keep interrupting, but of course all of these questions I object to on the ground that they are tied up with an expression of opinion as to the transmission of electric energy from Massachusetts. May it be stipulated that my objection on those grounds goes to this whole line, so I won't have to interrupt?

Trial Examiner: All right, it will be so understood. The witness may answer the question.

A The transformer of the question serves to transmit the energy from the 66 k. v. tap from Bristol Mountain to the 13.8 and 4.6 circuits at the substation.

By Mr. Wahrenbrock: *Q* Aside from the approximate energy losses in that transformer, to which you have referred, is there any difference between the amount of electric energy which enters that transformer and the amount which leaves it? *A* May I hear that question again?

Trial Examiner: Would you read the question again to the witness?

(The record is read.)

A No, excluding exciting energy.

By Mr. Wahrenbrock: *Q* And how much would that exciting energy amount to at the maximum? [*1667*] *A* A substantially negligible quantity, of the order of one per cent of full load output.

Q Is it possible for any different amount of electric energy to enter the primary coils of that transformer than the total leaving the secondary and tertiary coils of that transformer, aside from such relatively small transformer losses and negligible amount of exciting energy? *A* No.

Q Is there any appreciable delay or difference between the time electric energy enters that transformer and the time it leaves the transformer, neglecting the exciting energy? *A* No.

Q Is it possible for electric energy to leave that transformer at any substantially different time than it enters it, in any commercial quantity, excluding the exciting energy? *A* No.

Q Is any of the electric energy which enters that transformer ever stored for anything more than a very small fraction of a second, at most, excluding the exciting energy? *A* No.

Q What can you say about the storage of energy in the core of that transformer? *A* The energy upon which the excitation is dependent, enters and leaves the transformer every alternation.

Q And how frequently is that? [*1668*] *A* It occurs twice every cycle, or one-sixtieth of a second.

Q Would storage of electric energy for any substantial period of time in commercial quantities be possible, in that transformer? *A* No.

Q Will you explain what difference there is between the primary and secondary and tertiary in that transformer in the voltage in normal operation? *A* Neglecting exciting current and taken turn by turn, there is no difference.

[*1669*] *Q* Would it be necessary to redesign or reconstruct that transformer to secure different voltage ratios? *A* No.

Q Will you explain? *A* I have already described the process by which that change could be made in connection with another transformer. The same reconnection of turns in this transformer will produce the same effect. I will add that if provision had been made before hand to do this outside of the case, the mechanical effort would be less than to make the changes in the present transformer.

Q Does the three-winding transformer permit of any further application of the explanation you made with reference to two-winding transformers as to the possibility of connections of secondary turns outside of the transformer? *A* It would be of course possible to connect the two secondary coils in series, giving a resultant voltage equal to the sum of the two voltages.

Q When you spoke of two secondary coils, did you refer to the secondary, what is ordinarily known as the secondary and tertiary windings? *A* I referred to the 13.8 k.v. and the 4.6 k.v. windings.

Q Are the changes in voltage between the three windings changes of such a nature—I will restate that, please. Are the changes in voltage and current as between the three wind- [*1670*] ings changes of such a nature that the voltage and current in the 13.8 and the 4.6 k.v. circuits cannot subsequently be changed back to 66 k.v. or back to the original voltage and current, or do any other voltage and current commonly in use? *A* This can be done.

Q What facilities would be necessary to do it? *A* Additional transformers.

Q Would such transformers function in substantially the same way as those you have already described? *A* Yes.

Q Is there anything about the operations or function of the Bristol three--winding transformer which prevents a further change or any number of further changes in voltage and current to any voltage and current which may be desired in connection with the further transmission or the utilization of electric energy for any of the common purposes within the limits of the capacity of the system to supply the necessary amount of electric energy? *A* No.

Q In that answer, do I understand that you neglected the transformer losses and exciting current which you referred to as negligible? *A* In as far as they may affect the result.

Q Directing your attention to the instances as shown by Mr.

Miller, when electric requirements of the Bristol district [*1671*] were supplied solely from Massachusetts, will you explain what would happen if any part of the transmission facilities as you have described them in the Bristol substation should suddenly be removed or fail? *A* The circuit would be interrupted and the transmission stopped.

* * * * * * [*1677*]

Q Mr. Thomas, in my last questions of yesterday's session, I was asking about the three-winding transformer at Bristol. Will you please state whether there is more than one such transformer there. *A* There are two. I will state that so far in my testimony I have assumed three phase transmission circuits. I have been referring to transformers without distinguishing between a three phase transformer and a bank of three single phase transformers, even though in some cases in the system, as for example, Winsted, three phase transformers are used, while in others, as in Bristol, banks of three single transformers are used. This corresponds with the usual convention in one line diagrams of utility systems.

Q Are those transformers and their appurtenance facilities, including the synchronous condensers at Bristol, facilities for the transmission of electric energy from a distance?

Mr. Branch: The same objection that I stated previously [*1678*] in regard to this type of question.

Trial Examiner: The objection is overruled. The witness may proceed.

The Witness: Yes. That is, these step-down transformers and appurtenances, including the synchronous condensers, are a most important part of the facilities for transmitting electric energy from Massachusetts to Bristol. As is well understood, it is not practically feasible to transmit electric energy over considerable distances at generation voltages, nor to utilize the energy of transmission voltages in consumer appliances. It is therefore necessary, when using electric energy generated at a distance, to

raise the voltage to transmission value, at the sending end of the line, and to lower it to local distribution voltages at the receiving end. The transmission operation is not complete until the energy has been restored to the local distribution voltage and all the facilities involved in the restoration, including the synchronous condensers, are a part of the transmission facilities. They are all facilities that would not have been used if no transmission had been required.

Q Is what you have just said—

Mr. Branch: Excuse me. The witness was asked a certain question, and in the course of that he gave a long answer. A good deal of it was not responsive, but I am not going to base a motion on as much of that as I might, but merely ask that the [*1679*] references to transmission from Massachusetts be stricken out as not responsive, and it is not called for by anything that this witness knows of his own knowledge.

Mr. Wahrenbrock: Mr. Examiner, there was no reference in the answer to transmission from Massachusetts by name. That is, the word "Massachusetts" was not used.

Mr. Branch: May I have the answer read?

Trial Examiner: The answer will be read for the benefit of counsel.

Mr. W hrenbrock: I withdraw that comment. It was not used in the second part of the answer, to which I understood the objection to be addressed.

Mr. Branch: My objection is addressed to that part where he used the word "Massachusetts energy".

Trial Examiner: The reporter will read back the answer.

(Whereupon the last answer as above recorded, was read by the reporter.)

Trial Examiner: I believe the use of the expression is only descriptive of what he has already spoken of there, as to which he is familiar, of his own knowledge, according to his own statements. The answer will be permitted to stand. The motion is rejected.

By Mr. Wahrenbrock: *Q* Is what you have just said about raising voltage in order to transmit electric energy over some distance applicable [*1680*] to the Torrington to Winsted line and the transformers at each end? *A* It is.

Q Directing your attention to the instances prior to July 1, 1939, as shown by Mr. Miller, in which electric energy requirements of The Connecticut Light and Power Company's system in and near East Hampton, Leesville and Colchester, was supplied in full or in part with electric energy from Massachusetts, will you please describe the system of facilities with which that was accomplished, in general terms?

Mr. Branch: Just a minute. I am sorry, but these questions are so involved that I can't follow them.

Trial Examiner: Will you read the question back for the benefit of counsel?

(The record is read.)

Mr. Branch: Thank you.

A As already described, these facilities, starting at the East Hampton 2.3 k. v. bus were prior to July 1, 1939 the 13.8 k. v. to 2.3 k. v. step-down transformers at East Hampton, the 13.8 k. v. lines from Pole 110 near Portland to East Hampton, the 13.8 k. v. lines from the 13.8 k. v. bus at the Middletown substation to Pole 110 at Portland, the 66 k. v. to 13.8 k. v. transformers and buses at Middletown and appurtenances including the synchronous condenser, and the 66 k. v. lines [*1681*] and appurtenances coming from Massachusetts, as already described.

The 13.8 k. v. lines from Colchester and Leesville to East Hampton and the 13.8 k. v. transformers at Colchester, Leesville, Comstock Bridge and Westchester, are also included.

Trial Examiner: Does the reporter have that as 13.8 in both cases there or did the witness say "15.8" in one case?

(The reporter indicated the figure was 13.8 in both cases.)

By Mr. Wahrenbrock: *Q* Mr. Thomas, I had a similar question in my mind with respect to the voltage of the bus at East Hamp-

ton with which you began. Will you state what the voltage of the East Hampton bus with which you began your description of facilities, was? *A* 2.3 k. v.

Q What function was served by the facilities owned or operated by The Connecticut Light and Power Company from Pole 110 in Portland to East Hampton and Leesville and Colchester, including the step-down transformers and appurtenant facilities at those points? *A* Transmission.

Q Do those facilities serve any function of local distribution? *A* No.

Q When I say "Do those facilities" I mean as of the period [*1682*] of time you have been speaking, that is, prior to July 1, 1939, and was your answer so intended? *A* The answer is the same.

Q What fact did you observe which was particularly corroborative of that conclusion? *A* In some cases distribution lines were carried on the same poles as transmission lines.

Q In the light of explanations you have previously made, were those facilities facilities for the transmission of electric energy as distinguished from local distribution?

Mr. Branch: Of course my objection to all of this, I think, appears, and it is understood, is it not? The general statement I made yesterday applies?

Trial Examiner: I think there is some question sometimes as to where a line of questions begins and ends. In case there is any doubt, I would suggest that counsel—

Mr. Branch: I haven't been interrupting, but I thought that I made a statement yesterday that I objected to all questions whereby this witness characterized functions or use as distinguished between transmission and local distribution. In case there is any doubt I ask that all of his testimony this morning be stricken on that ground, and I would like to have it stipulated that I have an objection to any question along this line that is asked.

Trial Examiner: The motion to strike is rejected. The [*1683*] continuing objection will be noted.

By Mr. Wahrenbrock: *Q* I wish to qualify that question, Mr. Thomas,—in your opinion as an engineer? *A* Yes.

Q On the basis of the showing—

Mr. Branch: Excuse me. Will you read that last question?

Trial Examiner: Will the reporter read the question back to counsel? As I understand that last qualification to the former question—Did you want the whole question read or just the last statement, counsel?

Mr. Branch: Just the last statement.

Trial Examiner: Will you read that qualifying statement that counsel made in regard to the question?

(Qualifying statement read.)

Mr. Branch: I wanted to make it clear that my objection was even to the question in that form, and I ask that it be stricken.

Trial Examiner: I had understood that it was in that form, in view of your general language, and the motion will be rejected.

By Mr. Wahrenbrock: *Q* On the basis of the showing made by Mr. Miller, were those facilities facilities for the transmission of electric energy which was transmitted from Massachusetts and consumed [*1684*] in Connecticut, in your opinion as an engineer?

Mr. Branch: The same objection.

A It was.

[*1685*] Trial Examiner: The objection is overruled.

By Mr. Wahrenbrock: *Q* Will you describe the function performed by the step-down transformers intervening between the 66 k.v. lines and Pole 110. *A* These transformers convey the energy down from the 66 k.v. lines to the 13.8 k.v. bus. They also reduce the 66 k.v. line voltage to the 13.8 k.v. of the East Hampton circuit.

Q What are the approximate energy losses in such transformers, under normal operating conditions? *A* Similar to other power transformers, usually less than two per cent on full load.

Q Now, directing your attention to the facilities by means of which the Connecticut Light and Power Company supplied elec-

tric energy to the Borough of Groton, and the latter supplied electric energy to Fishers Island Farms, Incorporated, and the Fishers Island Electric Corporation until some time early in 1941, will you please describe in a general way that system and the function performed by the several parts thereof? *A* Energy from the high voltage facilities of the C. L. & P. Company in Connecticut was supplied to the 33 k.v. line which transmits it to the so-called Groton Long Point high voltage substation. In this substation 33 k.v. to 6.9 k.v. transformers step down the voltage transmitted to 6.9 k.v. From here, the power was transmitted to Groton Long Point [*1686*] brick substation near the shore of the Sound by 6.9 k.v. lines, partly in an aerial cable. A submarine cable was connected to the 6.9 k.v. bus there until February 28, 1945.

Mr. Branch: Do you mean 1941?

The Witness: 1941, I beg your pardon. This cable carried the energy under a branch of the Sound to Fishers Island, where the voltage was converted to 2.3 k.v. for local use to Fishers Island. Energy was taken off the 33 k.v. transmission line at the Trails Corner substation in Groton on the way to the Groton Long Point high voltage substation by means of 33 k.v. to 2.3 k.v. step-down transformers for supplying the Borough of Groton system.

At the Groton Long Point brick substation, energy was also taken off at 2.3 k.v. for local distribution. There were at least three other taps on the 33 k.v. line between the generating station at Montville and Trails Corner.

While the Borough of Groton which is served by the municipal system is a well-built up community, Groton Long Point is sparsely settled, with nearly all the population along the shore, on both sides of the Groton Long Point substation there is some two miles of open country between the territory of the Trails Corner substation and the boundaries of the Groton Long Point area. Most of the 33 k.v. line from Montville is sparsely inhabited rocky land.

Q What function was served by the facilities owned or [*1687*]

operated by the Connecticut Light and Power Company from its generator buses in the State of Connecticut to the point of delivery to the Borough of Groton?

Mr. Branch: The same objection, of course, as to the Groton matter as to the other.

Trial Examiner: The objection is overruled.

The Witness: Transmission.

By Mr. Wahrenbrock: *Q* Did those facilities serve any function of local distribution? *A* (No answer.)

Q Did those facilities serve any function of local distribution? *A* No.

Q Will you explain? I will rephrase my question. In the light of the explanations you have previously made, were those facilities owned or operated by the Connecticut Light and Power Company facilities for the transmission of electric energy as distinguished from local distribution, in your opinion as an engineer? *A* Now, just what is the question?

Trial Examiner: The reporter will read the question for the benefit of the witness.

(Whereupon the last question as above recorded, was read by the reporter.)

Trial Examiner: Does the witness have in mind what facilities counsel refers to?

[*1688*] The Witness: Yes. I will explain that in listing points at which energy is taken from the 33 k.v. line supplying Groton Long Point high voltage station, I am pointing out additional instances of what I have described as sub-transmission, or primary distribution. None of the facilities I have described, however, as transmission facilities, include any function of local distribution.

Mr. Branch: Well, I don't know that that is responsive. He was asked about certain facilities, and he made a general statement which may have applied to others.

Trial Examiner: I don't think the statement necessarily has been shown to be applicable to the particular question. I don't think the answer has been tied in with the question.

Mr. Branch: That is my point, sir. I ask that the answer be stricken.

Trial Examiner: Unless the witness is in a position to clarify the answer, it will have to be stricken.

The Witness: I would like to have a full statement of what the question is.

Trial Examiner: I suggest perhaps the quickest way of satisfying this is to strike the answer in accordance with the request of counsel for the respondent, and then permit the question to be read anew, and I suggest that the reporter read the question slowly to the witness.

(Whereupon the last question as above recorded, was read [*1689*] by the reporter).

Mr. Branch: Well, I think it ought to be clarified as to what was owned by the Connecticut Light and Power Company. I am not sure that this gentleman knows.

Trial Examiner: Is the witness familiar with the situation as to the ownership of facilities?

Mr. Wahrenbrock: Mr. Examiner, two questions back the witness for several paragraphs described the facilities.

Trial Examiner: I believe that is true.

Mr. Wahrenbrock: The question is as to those facilities owned or operated.

Mr. Branch: I think it appears in the evidence of Mr. Tiffany that the ownership of the Connecticut Light and Power Company stopped at a certain point along this line that has been described, and I think we ought to know clearly whether the witness is referring to some facilities which are not owned by the Connecticut Light and Power Company or whether—

Trial Examiner: The question itself says those facilities, and it is not any too clear as to just what facilities are referred to.

By Mr. Wahrenbrock: *Q* Mr. Thomas, at all times up to February 28, 1941, and after August 23, 1935, did the Connecticut Light and Power Company own or operate the 33 k.v. facilities up to the Trails Corner substation in Groton? *A* Yes.

[*1690*] *Q* Do you know whether The Connecticut Light and Power Company owned or operated the 33 k. v. transmission line from the Trails Corner substation in Groton to the Groton-Long Point high-voltage substation? *A* I cannot answer as to dates. They did at one time and their operation ceased, I believe, within the period you have limited, but I do not remember what date.

Q And do you know whether The Connecticut Light and Power Company owned the 33 k. v. to 6.9 step-down transformer in the Groton-Long Point high-voltage substation? *A* The same answer as regards the line.

Mr. Wahrenbrock: Mr. Examiner, it will appear from other evidence in the record what the exact dates are. I would like then to frame my question this way, if I may:

By Mr. Wahrenbrock: *Q* With reference to the parts of the 33 k. v. transmission line and the 33 k. v. to 6.9 k. v. step-down transformer and appurtenant equipment in the Groton-Long Point high-voltage substation, which were owned or operated by The Connecticut Light and Power Company during the period from August 25, 1939 to February 28th, 1941, will you state whether, in your opinion as an engineer, those were facilities for the transmission of electric energy which was transmitted from the State of Connecticut and consumed in the State of New York by persons other than the transmitter thereof?

[*1691*] Mr. Branch: I have several objections to that question, in addition to the very general ones which I specified and which I will not argue at length here.

There are two. If I understood the question correctly, it assumed that certain facilities—and I am thinking specifically of transformers at the Groton-Long Point substation, there may have been others—were owned by The Connecticut Light and Power Company up to some time in February, 1941. The evidence is directly to the contrary on that, so there is an assumption of fact that is incorrect.

I am picking that one out as I think it may be one of the clear-

est, although I think there are other assumptions in regards to dates of ownership that are incorrect.

Also, this matter of bringing in the language of the Act "consumed by a person other than the transmitter" is, I think, improper, and I object to the question on that ground as well.

Trial Examiner: It does not seem to make an awful lot of difference whether you say "a person other than the transmitter", or to say that is done by the transmitter. It seems to me that the first question you raise, the merit of it, depends upon the understanding of the word "during". It seems to me that the word "during" doesn't necessarily mean during all of the period. Perhaps that question might be cleared up by an amplification of the question by Commission's counsel.

[*1692*] Mr. Wahrenbrock: My intention was, and I believe it was obvious, to mean by "during", if that is the word I used, "during such time as it may have been owned or operated", as the facilities may have been owned or operated by The Connecticut Light and Power Company. The question does not assume ownership. By my preliminary statement I expressly indicated that that would be settled by other evidence in the record, and with respect to the second point "consumed by a person other than the transmitter", I suppose that by circumlocutions I could find other language that would say the same thing. I might even express it in Gaelic, but the mere fact that we avoid certain English words which happen to be used in the statute, has no virtue, I submit.

Mr. Branch: I submit it is very leading. It does not appear that the word "transmitter" means who transmitted, or what this witness understands by "transmitter". There is a perfectly proper way of getting at this if Mr. Wahrenbrock wishes to, and I object to this form of question.

Trial Examiner: I see no particular reason why Commission's counsel may not follow his own choice in the matter of language. If there is any question about it, the respondent may bring out that

fact in cross examination. The witness may answer the question. The objection is overruled.

The Witness: May I have the question?

[*1693*] Mr. Wahrenbrock: Before the question is read, Mr. Examiner, and bearing on the objection that has been raised and overruled, but for the sake of clarity of those who read the record at this point, I wish to refer to page 357 of the transcript where Mr. Tiffany's testimony has fixed the date of transfer of title of the transformers in question from The Connecticut Light and Power Company to the Borough of Groton, as being June 15th, 1937.

Trial Examiner: All right, you may proceed with the reading of the question to the witness.

(Question read by the reporter.)

A Yes.

By Mr. Wahrenbrock: *Q* Will you describe more fully the part performed by the step-up transformers connected to the generator buses in Connecticut and the step-down transformers in the Borough of Groton and the Borough of Groton-Long Point, so far as the supply of electric energy to Fishers Island was concerned? *A* The supply of energy for Fishers Island being remote, a 33 k.v. transmission line was made use of to transmit the energy to the Groton-Long Point high-voltage substation near the take-off point of the submarine cable, and step-down transformer to step the line-voltage down at Groton-Long Point high-voltage substation to a value suitable for the submarine cable, namely 6.9 k.v.

[*1694*] The balance of the transmission was accomplished by a short length of overhead line partly in cable and the submarine cable itself.

The final stepdown to reduce the 6.9 k.v. to a suitable voltage for local consumption occurred in 6.9 k.v. to 2.3 k.v. transformers on Fishers Island at the location in which the 2.3 k.v. local distribution was accomplished.

Mr. Wahrenbrock: Before continuing, Mr. Examiner, my attention is called—

Trial Examiner: Did that complete your answer to the question, Mr. Thomas?

The Witness: Yes.

Trial Examiner: All right.

Mr. Wahrenbrock: My attention has been called to page 366 of the transcript and 367 where the date of the transfer of title to the transformers in the Groton-Long Point high-voltage substation is further dealt with. I believe that is the matter that Mr. Branch had in mind in his last statement.

Mr. Branch: And is it not true that the date which you gave, which I think was mentioned by Mr. Tiffany originally, turned out to be incorrect?

Mr. Wahrenbrock: He fixes the date in line 8 on page 367 as November 15th, 1935.

Mr. Branch: 1935, yes.

By Mr. Wahrenbrock: [*1695*] *Q* Mr. Thomas, what are the approximate energy losses in such transformers, under normal operating conditions? *A* Similar to those of the other power transformers, that is, negligible.

Q Directing your attention to the transformers to which you have referred in your description of the transmission facilities by which the East Hampton District of The Connecticut Light and Power Company is served, or was served, prior to July 1, 1939, and by which Fishers Island was served, prior to February 9, 1941, will you explain their functions? *A* To transmit, transfer or convey electric energy from the primary to the secondary circuits,—the energy is received at the primary voltage and delivered at the secondary voltage. The number of turns in series in the primary winding is adjusted to the transmission voltage and the number of turns in series in the secondary winding to the secondary voltage. These transfers are practically instantaneous, with very small losses. I speak of these losses sometimes as negligible, sometimes as of the order of 2 per cent.

I would like to explain that while they are very small and do

not affect operations in bulk, they are not so small that the designer of the transformer does not take account of them.

Q What is the—

Mr. Wahrenbrock: I believe you have just covered that.

[*1696*] *Q* Do these transformers have core losses? *A* Yes.

Q Will you explain the core losses in general terms? *A* As I have already stated, every operating transformer must have its core excited, that is, impressed with alternating magnetism. It appears as a matter of experience that such alternating magnetism cannot exist without a cetrain waste of energy within the core itself, and this is what I have in mind by core losses.

Q Aside from the losses to which you have referred, is there any difference between the amount of electric energy which enters each of these transformers and the amount which leaves it? *A* No, excluding the exciting energy supplied through the primary winding.

Q How much does that exciting energy amount to? *A* Substantially negligible, perhaps of the order of 1 per cent of the output, full output, of the transformer.

Q Is it possible for any different amount of electric energy to enter the primary coil of any of such transformers than that which leaves the secondary coil, aside from such relatively small transformer losses and exciting energy?

* * * * * * [*1698*]

A No.

* * * * * * [*1699*]

Q Is there any appreciable delay or difference between the time electric energy enters any of those transformers and the time it leaves it, neglecting exciting energy? *A* No.

Q Is it possible for electric energy to leave any of those transformers at any substantially different time than it enters it in any commercial quantity, excluding the exciting energy? *A* No.

Q Is any of the electric energy which enters any of those transformers ever stored for anything more than a very small fraction

of a second at most, excluding exciting energy? *A* No. The energy stored in the core, however, goes in and out twice every cycle, that is, every sixtieth of a second.

Q Would the storing of electric energy for any substantial period of time be possible in a transformer? *A* No.

Q Will you explain what differences there are, if any, between the primaries and secondaries of those transformers in voltage and current, in normal operation? *A* Taken turn by turn, and neglecting the excitation of the core and losses, there is no difference between primary and secondary. I wish to state that this answer is made in terms of the simplified transformer that I have described at [*1700*] some length. That is, instead of considering the large coils of commercial transformers, I have dealt with single turns, all having the same voltage per turns. Primary turns have applied and counter e.m.f., and secondary turns only counter e.m.f. The current in the primary turns passes around the core in a direction opposite to the current in the secondary turns, all as so far described. When now the commeicral transformers are considered, such as those constituting facilities for the transmission of electric energy about which I have testified, some simplification can be made, in that, where several turns are connected in parallel to get a larger current capacity, there is no necessity for using separate turns of wire, and a single larger wire is usually substituted. This use of a heavy wire in some coils usually occurs in the low tension windings. The balance of the primary current and secondary current then becomes the balance of the current multiplied by the number of turns in the two windings. In this, the effect of the exciting current is ignored.

The above statements apply to all power transformers, including those about which I have testified in this case.

Q In the last series of questions which I have put to you about the transformers at Groton and the transformers at and near East Hampton, my questions have been sometimes in the present tense. Would what you have said apply equally to those transformers as

of the time of their operation as pre- [*1701*] viously fixed in the testimony? *A* It would.

Q Mr. Thomas, in order that the statements which you made about some of the facilities at Winsted may be clearly understood, will you state the time as of which your study was made with reference to those facilities, and if you made a field trip, and your study was made on observations on that field trip, will you indicate the dates of that field inspection. *A* I did make such a field inspection in the latter part of May, this spring.

Trial Examiner: In 1941, you mean?

The Witness: Yes. The answers cover a period as long as facilities have been the same, including the period covered by Mr. Miller's studies, except when otherwise specifically shown in questions or answers.

Mr. Wahrenbrock: That concludes my examination of Mr. Thomas on direct.

Trial Examiner: Before the cross-examination starts, there is one point I would like to clear up.

I think the witness testified that the energy was current times electro-motive force; is that correct?

The Witness: Yes, considering instantaneous conditions. If you are going to use that expression in a general sense, we have to remember that conventions have been adopted to [*1702*] simplify the handling of the alternating currents which are always changing, to get some figure which would represent something which doesn't change, as long as the current and voltage don't change, so-called effective values. Now, when you multiply effective electro-motive force by effective current, you have to take into account what is called power factor, and power factor is a factor ranging from zero to one, resulting from the fact that we have taken a special convention as to what this effective current and voltage means. It has to do with the relation of the exciting current in the system to the work current in the system.

Trial Examiner: In the case of an intervention of a transformer,

is the product of the current times the electro-motive force on the primary side approximately equal to the product of the current and the electro-motive force on the secondary side?

The Witness: That is true, if you ignore the exciting current. That is an enabling facility, you may say, which has to be there before it will operate. Otherwise, it is the same.

Trial Examiner: And that exciting current is transformer losses?

The Witness: Part of it. In addition there is heat losses which must be added to the exciting losses.

Trial Examiner: Since those are losses, then I presume that the secondary side is always less than the primary side. [*1703*] Is that correct?

The Witness: That is right.

* * * * * *

HAROLD E. MILLER,

previously sworn, resumed his testimony:

Cross Examination by Mr. BRANCH.

* * * * * * [*1738*]

Q I will put it another way. There are 21 days shown in Exhibit No. 61, are there not? *A* Yes.

Q And you finally confined your studies, as shown in the exhibit, to those 21 days, didn't you? *A* That is right.

Q And those 21 days were selected from 321 days, as to which you had given some attention, were they not? *A* Yes, they were selected from the 321 days.

Q Why the hesitation? Is there any doubt about that? *A* No. Merely that in my testimony, I had stated that I had an intermediate step, where I had secured the information on 34 days, and my process of elimination proceeded from 321 days to 34 days to 21 days, and I wanted to make sure that my answer was correct.

Q Mr. Miller, what were the 34 days that you selected from the 321 days? Will you give us those days? *A* The days?

Q Yes. *A* I haven't got my notes here. If I could get the Connecticut Valley Power Exchange log sheets, I can call them off to you from my notes.

[*1739*] Trial Examiner: We will have a recess for five minutes.

(At this point a short recess was taken, after which the hearing was resumed.)

Trial Examiner: The hearing will now be in order.

By Mr. Branch: *Q* Mr. Miller, isn't it a fact that before you came up here in May, 1941, you or someone working with you, or at your direction, had gathered elaborate statistics as to 34 different days? *A* 34 different days?

Q I should say 24 different days. *A* Yes. From the results of my first investigation, in August, 1940, I gathered information about certain days, and request was made, I believe, of The Connecticut Power Company, The Connecticut Light and Power Company, and the Torrington Electric Light Company for certain information which I intended at that time to use, but in view of the more recent field trip, I decided not to use that information.

Q Well, the fact is that as early as February, 1941, you had gotten a great deal of detailed information, including log sheets from several different places relating to 24 different days, hadn't you? *A* I had.

Q And you had picked out those 24 different days as a result of studies which you had made before that time, hadn't [*1740*] you? *A* I picked those days out as a result of the field trip I had made in August of 1940.

Q Yes, and you picked them out because you thought they were days as to which you could prove something significant, didn't you? *A* Yes.

Q I mean, you didn't just take them at random? *A* No.

Q As a result of this field trip and the investigations which you had made in August, 1940, you had selected certain days which looked to you as though they might give the best type of result for which you were looking, hadn't you?

Mr. Wahrenbrock: Mr. Examiner, in view of the testimony that has gone, I don't see the relevance or competence of examination with respect to studies previously made and concerning which testimony has not been put in.

Trial Examiner: The testimony may be relevant. The relevance does not fully appear. However, we will permit counsel to proceed with the present line of questions. You may answer the question.

The Witness: May I have the question read?

Trial Examiner: Will you read the question, Mr. Reporter?

(Whereupon the last question as above recorded, was read by the reporter.)

[*1741*] By Mr. Branch: *Q* There isn't any doubt about that, is there, Mr. Miller? *A* I wouldn't say the best type of information. I think as I recall I selected those days as indicating that The Connecticut Light and Power Company was the owner and operator of facilities for the transmission of sale at wholesale—well, in the case of those days I won't say "sale at wholesale" but for the transmission of the electric energy which was transmitted from a State and consumed outside that State.

Q And as a matter of fact, in your final studies as embodied in Exhibits 61 and 62, you have used only four of those 24 days originally selected. That is correct, isn't it? *A* To be truthful, I did not know until you just stated it that I had used any of those days.

Q You didn't know that you had used any of them, but after you studied the material that was gathered in relation to those 24 days, didn't you? *A* I did.

Q And then a postponement of this matter was asked for by the Commission in order for you to make this field trip in May, wasn't it?

Mr. Wahrenbrock: Mr. Examiner, I object to matters going outside—

* * * * * * [*1744*]

The Witness: I don't know the reasons for the postponements of the hearing.

By Mr. Branch: *Q* Well, you didn't have these studies of these 21 days made until after your field trip in May, 1941, did you, Mr. Miller? *A* As I previously stated, these days were obtained as a result of a field trip of May, 1941.

Q Yes, but you had made studies of certain other days a month before that, hadn't you? *A* Yes, sir.

Q And then you started on some new days when you came in May, 1940? *A* May, 1941.

Q 1940. *A* My field trip of August 19—

Q Can't you answer that yes or no? *A* I have got to answer the question so as to make some sense to the question. My field trip of August, 1940 was necessarily limited for the period prior to August, 1940. [*1745*] That left the question of operations of the Company between August, 1940 and the time of the hearing as a matter of which I would have no knowledge, and since it was necessary for me to get this additional information, I decided to review the whole picture, and that is why I made a fresh start.

Q You discarded the studies that you had made of this 24 days previous? *A* Yes, because the new start was comprehensive enough that any information obtained in the previous study would be contained in this new study.

Q Mr. Miller, you say that you picked out 321 days. Am I correct in assuming that you studied the entire period from January 1, 1937 to May 26th, 1941, when you picked out these days? *A* Exclusive of a period around the hurricane of 1938.

Q Yes. And will you just make some calculations roughly and see if I am correct? Your studies covered then a period of more than 1,600 days, did they not? *A* It appears to work out to 1,601 days.

Q 1,601 days that your study covered. Now, did you make any effort to find out how many of those days there were in which there was no possibility, according to your theory, that Massachusetts power went to any of the plants of the Connecticut [*1746*] Light and Power Company, with which you are concerned? *A* I made no effort to determine that.

Q You were not endeavoring to make a study that would give a comprehensive or complete picture of the situation?

Mr. Wahrenbrock: Mr. Examiner, I object to that question.

Trial Examiner: I think that is a—

Mr. Wahrenbrock: The witness has stated the purpose for which he made the study. It is not material or relevant to characterize it as being lacking in comprehensiveness because it doesn't do something that some other study might do.

Trial Examiner: Well, I think that we better have an explanation of what he meant by "comprehensive". It depends on what purpose it is comprehensive for.

Mr. Branch: I will clarify that, sir.

By Mr. Branch: *Q* You made no effort then to determine what portion of the time the plants of The Connecticut Light and Power Company were supplied entirely with Connecticut energy, according to your theory? *A* No, I made no attempt to determine the number of days or the period of time when The Connecticut Light and Power Company was being supplied with energy generated in Connecticut.

Q Your studies, however, made it perfectly apparent that a very large proportion of the time that was the situation, didn't it, according to your theory? [1747] *A* I had not considered that.

Mr. Branch: Will you read the answer, please? We couldn't hear it on account of the train.

Trial Examiner: The answer will be read by the reporter.

(Answer read by the reporter.)

By Mr. Branch: Well, you know that is so, don't you, Mr. Miller? *A* I don't know that it is so.

Q Isn't it a fact that in going over these log sheets you found day after day that didn't have even the elements of a situation that you would have to consider, in order to get Massachusetts power into these plants under your theory?

Mr. Wahrenbrock: Mr. Examiner, the witness's direct examination showed how he selected these 321 days, and the two or more

factors for which he looked. Now, if those are the elements that he referred to, the question may be understood. If there are other elements that are referred to, I confess that the slight acquaintance that I have been able to obtain of this matter, leaves me completely mystified as to what those elements referred to by Mr. Branch's question might possibly be.

Trial Examiner: If the witness can answer, he may.

The Witness: May I have the question read, please?

Trial Examiner: Will the reporter read the question to the witness?

(The question is read.)

[*1748*] *A* Yes, I found many days when no energy was being received at South Meadow from the plants in Massachusetts.

[*1749*] By Mr. Branch: *Q* As a matter of fact, that was the situation the vast majority of the time, wasn't it? *A* I don't recall.

Q Well, then, I take it you were not interested in trying to pick out days that were typical? *A* What do you mean by typical?

Mr. Wahrenbrock: Mr. Examiner—

By Mr. Branch: *Q* Typical of the usual situation.

Trial Examiner: I think with that explanation it is clear. I think that satisfies the question that you might raise.

Mr. Wahrenbrock: There is no showing that there is a single usual situation, Mr. Examiner. The fact is the evidence about the operation of the Connecticut Valley Power Exchange shows that typically there is no single typical situation with respect to the flow of power.

Mr. Branch: May I say this, Mr. Examiner. Under the practice with which I am familiar, and the gentlemen from Connecticut say it is the same, counsel are not permitted to make these statements in the course of cross-examination. If this thing is to continue this way, and statements can be made, I think the purpose and effect of cross-examination may be seriously interfered with. I request the Examiner to pro- [*1750*] tect me in that respect.

Trial Examiner: I think there has been something of that on

both sides, Mr. Branch. I see no reason for finding any fault with the right of counsel to ask a question. How far the question is relevant will be a matter for future determination. You may proceed.

The Witness: I would say the days I have selected are typical of operations that occur and recur frequently in the operations of the Connecticut Power Company, the Connecticut Valley Power Exchange, and the connections The Connecticut Light and Power Company had along the CP lines with The Connecticut Power Company.

By Mr. Branch: *Q* Well, I asked you whether you endeavored, in picking out these days, to pick out days that depicted situations that might be regarded as typical of all operations. At least, that is what I will ask you now. *A* I endeavored to pick out days when, as I have stated before, the operations were normal. By that I mean that there was no indication on any of the log sheets or other information that I received that indicated that there was anything unusual or abnormal about the operations, and I was only interested in picking out the days under those conditions when Massachusetts energy was being received at South Meadow and Falls Village [*1751*] generation was zero or less than the delivery to the Central Hudson Gas and Electric Corporation.

Q And those conditions obtained during a rather small proportion of the time, didn't they? *A* I don't know how to characterize—how you would characterize operations that occur during 321 days out of 1600 days as being particularly small.

Q During how many hours of the 321 days that you selected did those conditions obtain? *A* I haven't got the figures in front of me. I can't give you that.

Q You have them, I suppose, available? *A* I would have to work them up.

Q I say, you have them available somewhere here in Hartford? *A* I have got my notes here.

* * * * * * [*1756*]

Q Now, sir, I turn to your testimony, and this is, as I under-

stand it, your answer in regard to the 321 days, and I ask you, is this the correct explanation of the method of selecting the 321 days?

"They were days which contained hours"—I am not attempting to read this verbatim, but is it substantially correct? "When the generation at Falls Village was zero or less than the delivery to the Central Hudson Gas and Electric Company, and simultaneously there was receipt at South Meadow of electric energy from Massachusetts." *A* That is correct.

Q That is correct. Now, the generation at Falls Village wasn't zero if there was high water, was it? I mean, if there was high water, Falls Village was generating generally, wasn't it? *A* Well, Falls Village—I don't know how much storage it has, but I imagine rather than to spill, the Falls Village plant would generate.

Q And if it were periods when it was spilling, it would be generating at a pretty high rate, wouldn't it? *A* Well, the plant there has a generative—can generate apparently over 10,000 kilowatts.

Q Yes. [*1757*] *A* So that, if it was generating at full load, it would be generating over 10,000 kilowatts.

Q And did you make any study to enable you to determine whether these periods which, according to your calculations, were periods in which Massachusetts energy came over the Connecticut lines, were periods of high water? *A* Where?

Q The plants on the Connecticut River. *A* Well, in order for the plants in Massachusetts to generate, I believe most of them are on the Connecticut River, there must have been water or they wouldn't have generated.

Q The point is that it is a comparatively rare situation when Falls Village generation is at zero, and where those plants in Massachusetts have surplus water, isn't it? *A* I wouldn't call it rare.

Q Well, isn't it a fact that if one river is high, another river a few miles away is also likely to be high?

Mr. Wahrenbrock: Mr. Examiner, that calls for a conclusion that I think the witness has not been—

Trial Examiner: I think the witness has stated he doesn't know. It seems to me that that calls for a pretty intimate knowledge of geography and rainfall set-up of New England, and the witness has not shown he is familiar with it. He says he doesn't know.

By Mr. Branch: [*1758*] *Q* Did you make any effort to ascertain at what particular times the plants in Massachusetts on the Connecticut River did have—or the tributaries of the Connecticut River—did have surplus water? *A* No.

[*1759*] *Q* Then I take it you made no effort to determine whether the kind of situation to which you directed your attention was a common one or one which existed only when several different elements existed simultaneously. *A* I made an effort only to determine the facts, and I have stated the method I went about to obtain those facts, and if I were to start to enter into matters beyond the facts necessary to establish whether or not Massachusetts energy was delivered to The Connecticut Light and Power Company, there would be no end to it.

Q Well, let me say this, then. You are interested only in times when generation at Falls Village was little or nothing, which coincided with times when, according to your theory, there was receipt at South Meadow, of electric energy from Massachusetts—is that correct? *A* That is not correct.

Q Well, none of the days that you selected were days on which any other situation obtained, were they? *A* Yes.

Q Didn't you say that the 321 days that you selected were all days when the generation at Falls Village was zero or less than the delivery at the Central Hudson Gas and Electric Corporation and simultaneously there was receipt at South Meadow of electric energy from Massachusetts? *A* I did say that.

[*1760*] *Q* Well then, what is the difference between those two, sir? *A* You stated that I had said that I had only considered days when the generation at Falls Village was little or nothing. That is not correct.

Q What was the Falls Village capacity for generation? *A* I

think it has a nominal capacity of about 9,000, but it seems to me it generates as high as 10,500 or even slightly higher than that.

Q Did you consider any times when Falls Village plant was generating at capacity? *A* Yes, sir.

Q How many of the hours that are shown in Exhibit 61 are hours when Falls Village was generating at capacity?

Mr. Wahrenbrock: May the witness refer to Exhibit 61?

Trial Examiner: I think the witness may, if he desires. It is up to him to ask for those things. It is not for counsel to raise the question.

The Witness: I was just going to ask.

Trial Examiner: If the witness desires to refresh his mind he may be supplied with a copy of the exhibit. Let him examine my copy.

(Copy of exhibit is handed to the witness.)

Mr. Wahrenbrock: Mr. Examiner, while the witness is looking, may I have the pending question read by the reporter?

[*1761*] Trial Examiner: You may. The question will be read for the benefit of Commission counsel by the reporter.

(Question read by the reporter.)

A Mr. Examiner, before proceeding to do any further work on this, it has occurred to me that the question of what generation should be considered full capacity is rather difficult for me to answer, and if Mr. Branch could limit the figures on generation between certain values, I would be better able to answer the question.

By Mr. Branch: *Q* Well, you said it was rated at 9,000, but could generate more; isn't that right? *A* Yes.

Q Take 9,000. *A* As I understand the question, I am to consider only the hours given on these tables.

Trial Examiner: It is the hours that appear in the exhibit, and as I understand the limitation added by counsel, it is on which 9,000 or more is generated.

By Mr. Branch: *Q* Yes. And you can shorten it. Just pick out

the number of days there were in which 9,000 or more were generated at any hour. *A* Oh, on eight of those days shown in this table the generation at Falls Village exceeded during some hours, 9,000 [*1762*] kilowatts.

* * * * * * [*1771*]

Q Is it true that all or substantially all of the hours which are shown in these exhibits, 61 and 62, represent only one particular combination of operating conditions? [*1772*] *A* No.

Q Is it not true that all or practically all of the hours shown on these exhibits were hours at which there was a small demand on The Connecticut Light and Power Company's plants, with which we are interested. Of course I refer to Winsted, East Hampton and Bristol. *A* No.

Q I direct your attention to Exhibit 61. That day was a Sunday, was it not, the first day there, May 2nd? *A* Yes, sir.

Q And the loads on Sundays are very much less than on week days, are they not? *A* Yes, that is true.

Q So it is true that on that day each of the hours shown here represents a time when there was a light load. That is true, is it not? *A* For Sunday, May 2nd, 1937, that is true.

* * * * * * [*1773*]

Q Now, I am confining the questions, for the time being, [*1774*] to those situations which you represent by letters A. C, E or I, and I direct your attention to the sheet for Wednesday, May 12th, 1937. The only hours in categories A, C, E or I on that day were for 3:00 to 7:00 A.M., were they not? *A* That is all the table shows.

* * * * * * [*1775*]

Q The loads at those times of day are very light as compared to other times of day, are they not, Mr. Miller? *A* I would say they are light. I don't particularly think that there is anything extreme about them. They are just light, as compared to other hours of the working day.

Q Well, isn't it a matter of fact that anybody knows that there

is very much less demand for power except under unusual circumstances, between 3:00 o'clock and 7:00 o'clock in the morning than at other times of the day? *A* There is usually less demand. I wouldn't characterize it by saying "very much less". There is less demand.

Q You are not willing to say that it is very much less? *A* No.

Q In 1937, I am not talking about the time when the factories were working nights, but ordinary times. *A* Even here you have 5,000 kilowatt-hours delivered to Bristol during four of those hours, and 6,000 during the hour ending 3:00 A.M., and a maximum is shown on that table for that day which is around 2:00 or 3:00 in the afternoon, of 12,000. That ratio is not extreme, by any means.

[*1776*] *Q* Less than half, isn't it? *A* Just about half, 6,000 to 12,000 is just about half.

Q You wouldn't call that very light? It runs from 5,000 to 12,000. Most of the hours at Bristol are 5,000, not 6,000. *A* Yes, and only two of the hours are 12,000.

Q Well, characterizing that as you want, the only hours which are in the categories A, C, E or I on that day are those hours from 3:00 to 7:00 A.M., are they not? *A* That is true.

Q Now, turning over to the next sheet, Tuesday, June 1st, the only hours on that day which are shown as in those categories are the hours from 1:00 to 7:00, are they not? *A* That is right.

Q And the deliveries to Bristol during those times ran from 2,000 to 4,000 as contrasted to a maximum of 13,000 as shown on that day, did they not? *A* That is right.

Q The next day that was shown is Monday, July 5, which is a holiday, is that not correct? *A* That is correct.

Q And it appears that at that time the loads at Bristol were 3,000 or less throughout the hours shown there, does it not? *A* That is correct.

Q On the next sheet, which is Friday, May 13th, there [*1777*] is no hour that is within the categories that we are speaking of, is there? *A* No A, C, E, and I.

Q The next day which we are speaking about in your exhibit, which is 61, is Monday, May 30, which again is a holiday, is it not? *A* That is correct.

Q And even so, the only hours of that day which are shown in your Exhibit 61 are the hours from 4:00 to 9:00 A.M., are they not? *A* Showing flow condition A.

Q Yes, sir. The load at Bristol—

Mr. Wahrenbrock: I will have to protest the continuance of this process which is now in its second repetition of going through this twenty-one page table, and picking out little elements of it, and trying to give them a disproportionate emphasis instead of letting the table rest for how it speaks.

Trial Examiner: The table will speak for itself, in any event. Then counsel may proceed with the cross-examination. The objection is overruled.

Mr. Wahrenbrock: It is just a process of reading what is already in the record and it takes time and costs money.

Trial Examiner: However, we will permit it for the present.

By Mr. Branch: *Q* The next day is May 30th, 1938, which I think I covered.

[1778] Trial Examiner: You discussed that.

By Mr. Branch: *Q* And the next day is Monday, August 1st, 1938, is it not? *A* Yes, sir.

Q And the only hours on that day which come within the categories which we speak of are the hours of 1:00 to 6:00 A.M., or rather, 2:00 to 6:00 A.M., are they not? *A* That is right.

Q And the load at Bristol was 2,000 or less during each of those hours, as contrasted with a high on the day of 10,000, was it not? *A* That is right.

Q Without going through the rest of these, Mr. Miller, are you now willing to concede that all of the hours that fall in these categories were hours of light load?

Mr. Wahrenbrock: Same objection, Mr. Examiner.

A Not without going through all. I haven't gone through these tables with that thought in mind, and I don't want to.

Trial Examiner: That is with regard to A. C. E and I, isn't it?

Mr. Branch: Yes, sir.

* * * * * * [1789]

Q Now, in general, did you not find, Mr. Miller, that on the days which you selected, conditions varied from hour to hour, that is, you had to put into different categories different hours on the same day? *A* Yes, although there were many instances of the same conditions applying over a series of hours.

Q But speaking by and large, even on these days which you selected, there were some days or there were some hours of each of the days when according to your theories the energy supplied was pure Connecticut energy, is that correct? [1790] *A* The tables don't indicate that.

Q What did you say? *A* The tables don't indicate that.

Q Do not indicate that there were changes from hour to hour? *A* That wasn't your question.

Mr. Branch: Will you read the question, please?

Trial Examiner: Read the question back for the benefit of counsel.

(The question is read by the reporter.)

By Mr. Branch: *Q* You say the tables don't indicate that? Now, isn't it true that you haven't indicated any hour during this entire period of two and a half years where there was Connecticut energy purely? *A* The tables do not show any instance of pure Connecticut energy as being delivered to all the points.

Q Now, Mr. Miller, let's be open about this. Isn't it a fact that when you did come to pure Connecticut energy you just dropped that out?

Mr. Wahrenbrock: Mr. Examiner, I object to the implication. We have been entirely open from the beginning, and the testimony of the witness on direct examination was explicit that he was showing instances when Massachusetts energy reached here.

Trial Examiner: I think the purpose of that is clear. I [1791] don't think there is any inference of concealment, and I think that perhaps the suggestion in counsel's question is rather unfair.

Mr. Branch: Well, I will leave that out, Mr. Miller.

By Mr. Branch: *Q* Isn't it a fact that if you did find an hour when there was what you considered pure Connecticut energy, you dropped that? You not only didn't show that on the chart, but you also eliminated it from the table for the day?

Mr. Wahrenbrock: Mr. Examiner, may the question be directed to the particular points that respondent's counsel had in mind? There are at least three points that are significant, and it is not clear from the question whether he means to ask with reference to all three, or with reference to some particular one or two.

Mr. Branch: With reference to all three.

Trial Examiner: The witness may answer.

A If, during any hour of a day shown in this table, Exhibit 61, none of the flow diagrams I have prepared in Exhibit 62 applied, I omitted that hour, because I wished to tie the table and the flow diagrams together.

By Mr. Branch: *Q* And the flow diagrams, none of them, of course, does show any day when there was pure Connecticut power, or any hour when there was pure Connecticut power received in all three [*1792*] of these places? That is correct, isn't it? *A* That is correct.

* * * * * * [*1797*]

Q Well, there wasn't any meter or group of meters at Winsted which showed where the energy came from, or was there? *A* Yes. There was a meter, not at Winsted—at Torrington there was a meter, at Torrington, which indicated that the Winsted district received energy from the Torrington Electric Light Company.

Q But it didn't show anything as to where that Torrington energy came from, did it? *A* That meter by itself, no.

Q And, of course, there wasn't anything at Winsted that showed whether energy came from Massachusetts or Connecticut was there? *A* As far as I know, there was no meter at Winsted.

[*1798*] *Q* Well, then, the answer is no? *A* No.

Q There wasn't any meter at Bristol, or a group of meters at Bristol that showed what State the energy came from, was there? *A* By itself, no.

Q And there wasn't any meter or group of meters at East Hampton, or in that district, whatever you want to call it, Portland to Middletown, that showed what State the energy came from, was there? *A* No meter which indicated where the energy came from.

Q And, of course, the current is in no way different in any way that can be observed, whether the energy came from one State or another State, is there? *A* Electric energy generated in whatever State is electric energy.

Q Yes, and it is all just the same, isn't it? *A* Electric energy is the same, yes.

Q And there is no way of identifying the source of energy from observing the energy or measuring the energy at a particular point, is there? *A* That is not true, Mr. Branch. At South Meadow substation there is a combination of meters that do enable you to determine whether energy from Massachusetts is delivered to the CP lines.

[1799] *Q* But you have explained how you used those. I wasn't referring to that. But there isn't any meter at any one of our points that would enable any one of our men, by looking at it or observing it, to know where the energy came from, is there? *A* There is no meter at any one of your points that your men could determine by looking at where the energy came from.

Q No. And in order to ascertain where that energy came from, you felt it necessary to make the elaborate studies which you have described, did you not?

Mr. Wahrenbrock: Mr. Examiner, "the studies which the witness has described" is ambiguous, because he has described, as his cross-examination has brought out, at least two studies, one of which was superseded by a further study.

Trial Examiner: I understood counsel to mean Exhibits 61 and 62.

Mr. Branch: Yes, sir.

Trial Examiner: That is what you mean. With that understanding, the witness may answer the question.

The Witness: Except I wouldn't want to characterize the studies as being elaborate. I made such studies as enabled me to present the facts, as was done in my testimony and in the Exhibits 61 and 62.

Mr. Branch: *Q* Now, these studies are all predicated upon certain [*1800*] principles which you assumed, are they not, Mr. Miller? *A* You do not mean by the word that I have "assumed" that I originated them, do you? I mean, I just want to clear up the term.

Q I will ask you whether you did originate any principles? *A* I did not originate any principles.

Q All right. Is it true that the validity of your results as embodied in the studies, is necessarily dependent upon the correctness of this principle?

Mr. Wahrenbrock: I am sorry, I didn't hear. The correctness of what?

Trial Examiner: I believe the last word was—

Mr. Branch: "principle", I said.

Trial Examiner: Then I don't know yet. You referred principles a while ago.

Mr. Branch: Let me rephrase my question.

By Mr. Branch: *Q* It is true, is it not, that the validity of your conclusions as expressed in the flow diagrams, and which are Exhibit 62, and in the study which is Exhibit 61, is dependent upon the correctness of this theory that if a conductor is carrying energy in one direction, there can be no flow of energy in the reverse direction? *A* I think you should modify that to some extent, at least. [*1801*] The statement is correct if you modify it to speak of conductors of the type we are dealing with, such as transmission lines of the CP company and the buses at South Meadow, and the lines of The Connecticut Light and Power Company, and

The Torrington Electric Light Company. I think that statement is correct.

Q Now, Mr. Miller, up to the time you came to the Federal Power Commission, did you have occasion to make studies or prepare diagrams of the kind as shown by Exhibits 61 and 62? *A* I did not.

Q None of the work that you had up to that time called for any studies of that kind on your part, did they? *A* None of the work I had before required me to make flow diagrams similar to Exhibit 62 or the tables similar to Exhibit 61.

* * * * * * [*1802*]

Q Now, have you made up diagrams or studies similar to the one you made for this case, in other cases? *A* I have made tables rather more comprehensive. I won't say more comprehensive, but more detailed than are shown here, in connection with the Ohio Public Service case. I did not prepare any flow diagrams. As I say, I assisted Mr. Woll in some of the tables he prepared for The Hartford Electric Light Company, and those cases are the only cases with which I have been connected.

Q Is it correct to say your experience in this kind of studies, and in preparing this kind of diagrams and tables, is limited to the Ohio Public Service case, this case, and some assistance which you rendered to Mr. Woll in The Hartford Electric Light Company case? *A* That is true, as far as formal proceedings are concerned My work requires me to prepare information concerning the operations of utilities. I described my general duties [*1803*] when I was on direct examination. And the preparation of information of that kind is quite similar, although it doesn't have to be put in quite as formal a fashion as the information required for the preparation of the tables in Exhibit No. 61, or the flow diagrams in Exhibit No. 62.

* * * * * *

Q Mr. Miller, is it true that never until May of this year did you prepare flow diagrams similar to the ones which are presented

in Exhibit 62 in any case? *A* No, I never prepared flow diagrams similar to these for any case. The necessity of preparing a flow diagram will depend on whether a flow diagram need be prepared for a case.

Q Now, none of the studies as to these days which are illustrated by the flow diagram or by Exhibit 61, show any energy, according to your theory, coming from New York, do they? *A* No.

* * * * * * [*1809*]

Q Well, now, you have gone through elaborate studies in order to trace what you say is Massachusetts energy in Connecticut. Where was that Massachusetts energy which you, on your theory, traced in Connecticut, generated? *A* I did not make a detailed study of the sources of the energy transmitted from Massachusetts. I am aware there are plants of the Western Massachusetts group up in Massachusetts that supply hydro-electric energy to the Turners Falls Power and Electric Company. I am aware that Turners Falls has their connections with the New England Power. For my pur- [*1810*] poses, it was only necessary for me to determine from the record whether energy was transmitted from Massachusetts and consumed in Connecticut. And I can make this further statement, I am not aware of any line of the Western Massachusetts company which is connected to Connecticut sources of energy supply except the Hartford-Agawam line.

* * * * * * [*1820*]

Q Mr. Miller, did you make any study to ascertain what part of the electric energy which under your theory was supplied to these three plants of The Connecticut Light and Power Company at Bristol, Winsted and at East Hampton, was supplied by power from Connecticut and what percentage by power from Massachusetts under your theory?

Mr. Wahrenbrock: May I have the question read, please?

Trial Examiner: The question will be read for the benefit of Commission's counsel.

(Question read by the reporter.)

Mr. Wahrenbrock: Mr. Examiner, I object to the question as being ambiguous, whether it refers to any particular hour, or whether it refers to all the hours in the aggregate.

Mr. Branch: I said any study—I don't know how the question could be broader. I think I made it as to any study.

Trial Examiner: The witness may answer.

A I have considered the question of percentage of Massachusetts energy delivered to Winsted, Bristol and East [*1821*] Hampton during the hours shown on this table, and, as I have stated before, during the hours illustrated by flow diagrams A—

Mr. Branch: Well, that answers my question.

Trial Examiner: You may proceed.

By Mr. Branch: *Q* Except now I ask you have you made any other study to determine those percentages, except for the hours that are shown on these flow diagrams?

Trial Examiner: I don't know whether I understand that question. The hours are not shown on the flow diagrams.

Mr. Branch: I think that your suggestion is entirely correct. The hours which are covered by Exhibit 61 and illustrated by the flow diagrams, Exhibit 62. *A* Other than the hours when 100 per cent Massachusetts energy is shown as being delivered to Winsted, Bristol and East Hampton, I have not calculated the percentages of Massachusetts energy delivered at those points.

Q Take the hours when you have considered that energy was delivered both from Massachusetts and from Connecticut sources, according to your theory, have you made any calculations to determine the percentages? *A* Do you mean by that, hour by hour, the amount of percentage at each point?

Q Hour by hour, or any other way. [*1822*] *A* I have considered the general question of energy from both sources going to each point, but I have not made calculations for each hour.

Q Is it not true that in the hours in which you concluded that Massachusetts and Connecticut energy were both supplied to

these points, that Massachusetts energy or Connecticut energy predominated in most instances? *A* (No answer).

Q Well, if it is going to take a good deal of time to do this, we can probably work it out. Maybe I can clear this up for the purposes of cross-examination.

Did you mean to convey in your testimony, your direct testimony, the impression that where there was mingling, under your theory, Massachusetts energy predominated or not? *A* I did not attempt to create any impression, I presented figures and the figures speak for themselves.

Q Have you endeavored to ascertain, or do you know if it is true that at all of these hours that are shown in Exhibit 61, your largest study, the Hartford steam plant was generating, and its generators were connected with the C. P. lines 1 and 2?

Mr. Wahrenbrock: May I have the first part of that question read, please?

Trial Examiner: I think perhaps the reporter better read the whole question.

[*1823*] (Question read by the reporter.)

Mr. Wahrenbrock: The question is slightly ambiguous in that it does not specify which of the Hartford's several generators it means when it says that Hartford's generators were connected, were generating and connected.

Mr. Branch: I think he can answer that question.

Mr. Wahrenbrock: I press the objection, Mr. Examiner.

Trial Examiner: Is there any question of more than one group of Hartford generators involved in the C. P. lines?

Mr. Wahrenbrock: Yes, I understand there are more than one, possibly four or five Hartford generators that are connected to the 11 k. v. bus which is connected by the lines that have been referred to as 122, 123 and 124, with the 66 k. v. bus of the Connecticut Power Company at South Meadow.

Trial Examiner: Does counsel refer to the Hartford generators at South Meadow?

Mr. Branch: Yes, sir.

Trial Examiner: Does that clarify the question?

Mr. Wahrenbrock: No, sir; that is where there are four or more, I think five generators located.

Trial Examiner: Does the witness understand the question?

The Witness: I will answer it as I understand it, and state what my understanding is.

Trial Examiner: All right, you may do that.

A I made no attempt to note on the Connecticut Valley [*1824*] Power Exchange sheets how much The Hartford Electric Light Company was generating or what plants of The Hartford Electric Light Company were generating, and I have previously testified that The Hartford Electric Light Company's 11 k. v. bus was connected through transformers to the 66 k. v. bus of The Connecticut Power Company, and that C. P. 1 and C. P. 2 lines were connected to the 66 k. v. bus. I believe I have covered the question.

* * * * * * * [*1847*]

Q I call your attention to a list which you have handed me headed "Days having hours when Falls Village generation was zero and simultaneously Massachusetts energy was received at [*1848*] South Meadow Station"; also a list headed "Days having hours when Falls Village generation was less than the deliveries to Central Hudson Gas and Electric Corporation, and simultaneously Massachusetts energy was received at South Meadow Station. Those two lists contain the 321 days that you refer to in your direct testimony and which were also referred to in cross examination? *A* Yes, sir.

Q They do not indicate, do they, the hours of the days in which the conditions indicated by their headings occurred? *A* They do not.

Q And you do not mean that during all of each of those days the conditions obtained, indicated on their respective headings, do you? *A* I mean that those days had hours when Falls Village generation was either zero or less than the delivery to Central

Hudson Gas and Electric Corporation simultaneously with the receipt at South Meadow of energy from Massachusetts.

Q They do not indicate, do they, how many hours on each day the condition indicated obtained? *A* They do not.

Q You are unable to say, I understand? *A* At this moment I couldn't say that.

Q Now, is it possible that even when the conditions indicated in these headings occurred, the Massachusetts energy [*1849*] which, according to your theory was received at South Meadow substation went in whole or in part to the 11 k. v. bus of the Hartford Electric Light Company? *A* Every effort was made in the collection of those days to omit any days when the energy went in whole to the 11 k. v. bus from South Meadow. It is possible that there may be one or two that were inadvertently included in that list that should not be, but I would say that practically every day stated there during the hours when energy was being received at South Meadow from Massachusetts and Falls Village.

Just a minute. I am sorry. Your statement about the percentage going to the 11 k. v. bus is impossible on its face because when Falls Village generation is zero or less than the deliveries to Central Hudson Gas and Electric Corporation, it is impossible that all the energy coming from Massachusetts to South Meadow should go into the 11 k. v. bus because the loads on the C. P. lines have to be served from some source, and when Falls Village is unable to serve it they must be served from South Meadow.

Q Well, you say it would be impossible then, according to your theory, that all of the energy during one of the hours in question went into Hartford? It is not impossible, is it, that during the hour energy also was delivered, according to your theory, from the Hartford generating plant to the C.P. lines? *A* Yes, I have indicated in the tables at the head that [*1850*] there are certain flow conditions when energy from Massachusetts alone passed into C.P. 1 and C.P. 2 lines at South Meadow, and there

were other conditions when the energy from Hartford and from Massachusetts passed into the C.P. 1 and C.P. 2 lines.

* * * * * * [*1852*]

Q Isn't it true, Mr. Miller, that in any of the hours which are in the days which are included within the descriptions of Exhibits 64 and 65, energy may have been delivered to the South Meadow substation, generated at The Hartford Electric Light plant, according to your theory? *A* Yes, that may be true, and the reverse may be true. Energy may not have been delivered from The Hartford Electric Light Company to the South Meadow substation.

Q And you just don't know about that, I take it?

The Witness: Can I have the previous question, so I can relate the two?

Trial Examiner: Read the question back to the witness.

(The record is read by the reporter.)

[*1853*] Mr. Branch: Let me rephrase the question.

Mr. Wahrenbrock: Mr. Examiner, before it is put, may I ask counsel to clarify the question, what he means by "here", whether he means on these two lists or some other place.

Trial Examiner: I think that possibly might be followed from the context.

By Mr. Branch: *Q* Mr. Miller, I am now referring to Exhibit 64 for Identification and 65 for Identification. I am referring to the hours in the days on those lists, in which the conditions obtained indicated by the heading on those days. Is it not possible that during each of those hours energy was also received at the South Meadow substation, which under your theory, was generated by The Hartford Electric Light Company? *A* No.

Q Why not? *A* You used the expression "during all of those hours." It is during some of those hours, energy may have been delivered from The Hartford Electric Light Company to the South Meadow substation. During other hours energy was definitely not delivered from the South Meadow—I mean from The Hartford Electric Light Company to the South Meadow substation.

Q Well, you have analyzed certain of the hours of these days, and have embodied your analysis in Exhibit 61 and the flow diagrams, which is Exhibit 62, is that correct? [*1854*] *A* I have prepared a table for 21 days, and flow diagrams, illustrating the flow conditions existing during the hours of those 21 days.

Q Except what is shown in those exhibits, I take it you do not know whether the condition I have mentioned obtained during the rest of the hours or not, is that correct? *A* The rest of the hours of what?

Q Of these days on these lists. *A* I do not know specifically, hour by hour, what the flow conditions were on those days, but I do know from my examination of the Connecticut Valley Power Exchange log sheets that I observed many days having hours when Massachusetts energy was received at South Meadow, and simultaneously energy was delivered to The Hartford Electric Light Company and also Falls Village generation was zero, or less than the energy delivered to the Hudson Gas and Electric Corporation. But I did not attempt to copy all the information that is contained in the log sheets. It would have been unnecessary for my purposes, and a rather stupendous undertaking.

* * * * * * [*1855*]

Q Assume there was just one plant in Massachusetts that was generating energy which was connected with the Hartford-Agawam line; assume this was an hour in which you have testified Bristol was supplied entirely by energy from Massachusetts; assume that that Massachusetts plant during that hour shut down; what would have happened?

* * * * * * [*1856*]

The Witness: You have not given me sufficient information. You told me concerning a plant in Massachusetts being connected to the Hartford-Agawam line as being the only plant in Massachusetts. You have not told me whether or not there were any plants in Connecticut which were connected with those lines, and I

can't answer the question without having the information more complete than that.

* * * * * *

Q Don't you know from your investigation, Mr. Miller, that at all times the South Meadow and Falls Village generating plants were connected to CP lines 1 and 2? [*1857*] *A* I do not know that.

Q Do you mean to say in your investigation you did not ascertain that fact? *A* You asked me if I knew that they were, and I say I do not know that they were. I know there are occasions when Falls Village was cut off from CP1 and CP2 lines.

Q And that was the occasion when The Hartford Electric Light Company was cut off, wasn't it? *A* I did not see any statement that it had been cut off.

Q Don't you know from your examination of this matter that that plant was always connected with the CP1 and CP2 lines? *A* I have not been concerned with the Hartford steam plant. I was concerned with determining whether or not Massachusetts energy was received at South Meadow and delivered to CP1 and CP2 lines for delivery to loads along those lines, and the question of whether or not the Hartford plant was or was not operating did not enter into that study directly.

Q Didn't the log sheets which you examined show the Hartford plant was generating every hour? *A* I did not examine the sheets to determine that.

* * * * * * [*1860*]

Q And you mean to say now you don't know whether it is a fact that these log sheets did show that every hour there was a generation at the South Meadow steam plant? *A* I do not know whether those log sheets show generation at the South Meadow plant of The Hartford Electric Light Company every hour.

Q Well I notice you say "every hour". You were aware of the fact, were you not, that that was, if not the universal situation, the almost universal situation? *A* I really can't say that I was

aware of it. I will be frank to say it will be my impression that there were units of the Hartford Electric Light Company, if not actually generating, available to deliver energy, but I would not [*1861*] have any reason to know whether the units were definitely generating. They could be floating on the line.

* * * * * * [*1864*]

Q I want to know if this is a correct statement. Your flow diagrams which are in evidence as Exhibit 62 show only the situations which existed in those hours which are listed in Exhibit 61. Is that correct? *A* That is correct.

Q And those flow diagrams are all based on the assumptions that there can be no simultaneous counterflow of energy, is that correct? *A* I wish you would clarify that question, Mr. Branch.

Q If it is possible that there is simultaneous counterflow of energy on the conductors between the 66 k.v. bus at the South Meadow plant and the 11 k.v. bus in the Hartford Electric Light Company plant at South Meadow, the basis for these flow diagrams would disappear, would it not?

The Witness: Could I have that question read to me?

Trial Examiner: Will you read the question back for the benefit of the witness?

(Question read by the reporter.)

A I must first state that—

Mr. Wahrenbrock: Mr. Examiner, I am going to object to that [*1865*] particular question as going beyond the scope of proper cross-examination. The witness has not been examined upon the theories if they are theories, or the principles put on to support those theories, which underline the statements that have been made. If respondent's counsel wants to inquire into that question, he is at liberty to examine Mr. Thomas, who has testified on that point.

Trial Examiner: I believe that the point is well taken. As I recall, it may be that in the cross-examining of a second witness, counsel may have become slightly confused as to what testimony

was given by each witness, but I do not recall that the present witness testified in direct examination on this. If he did, I would be glad to have my attention called to it.

Mr. Branch: Well, sir, I think possibly we can clear this thing up quickly. Let me ask another question.

By Mr. Branch: *Q* Is it true, Mr. Miller, then, that you do not know the basic principles upon which these flow diagrams are prepared?

Mr. Wahrenbrock: Mr. Examiner, there is no basis in the record for that.

Trial Examiner: I don't think that question arises particularly. If the witness didn't testify to them, they are not in line of examination.

Mr. Branch: I am somewhat astounded, if I understand the situation.

[*1866*] Trial Examiner: I am not sure of the purpose of your asking the question. If the purpose of asking the question is to explore the basis of the preparation, that may be another matter, Mr. Branch.

Mr. Branch: That is one purpose. I don't want to mislead you into thinking it is my only purpose. I think it is rather surprising that the witness prepares some exhibits, and they are introduced in evidence in his testimony, that I can't inquire as to the principles which underlie the preparation, or ask whether he knows them.

Trial Examiner: You may ask that. That is certainly clear.

Mr. Wahrenbrock: Mr. Examiner, I have long postponed a request that I wish to make, and I started to make at the beginning of this line of inquiry and which I postponed in order that I may not interrupt this line of inquiry, but I wanted to ask, because I didn't hear clearly the preceding question and answer which related to flow diagrams and Exhibit 61.

Trial Examiner: The question and answer will be read for Commissioner's counsel. Does that bear upon any question of any possible objection? Unless it does, I would like to have the wit-

ness complete the answer, and then have the previous question and answer read, if it is not material to any objection you propose to make.

[*1867*] Mr. Wahrenbrock: Well, if it is as I recall it is, I will have an objection to make.

Trial Examiner: All right. The Reporter will read the question and answer requested by Commission counsel.

(Question and answer read by the reporter.)

Mr. Wahrenbrock: Mr. Examiner, the question was not as I had recalled it.

Trial Examiner: Does the witness have the present question before him?

The Witness: I do not.

Trial Examiner: The last question will be read for the benefit of the witness.

(Question read by the reporter.)

By Mr. Branch: *Q* Do you of your own knowledge or your own experience know whether there can be simultaneous counterflow of energy in the same conductor?

Mr. Wahrenbrock: Mr. Examiner, I am perfectly willing to have that question put to the witness, but I think it should be labeled "Direct-examination" and it should so appear in the record because it is outside the scope of cross-examination.

Trial Examiner: I don't think that that is necessarily so. We will permit the witness to answer the question. It may be close to the line, but it goes to the matter of the basis of his preparation of the exhibits.

[*1868*] The Witness: I will have to have the question read.

Trial Examiner: All right, you will read the question back to the witness.

(Question read by the reporter.)

A When conductors are of the type and size and the dimensions used in South Meadow substation and other substations, there cannot be simultaneous counterflow.

Mr. Branch: That does not quite answer my question, Mr. Miller.

By Mr. Branch: *Q* I asked you whether you knew from your own knowledge or your own experience that that was so. What knowledge or experience have you had, if any, which enables you to make that positive statement? *A* I previously stated I was educated as an electrical engineer.

Q What experiments or study have you ever made that enables you to reach the conclusion which you have stated as to counter-flow? *A* In the study of electrical engineering in order to have energy flow in a circuit, it is necessary that there be a current flow in the circuit. In order that there be a current flow, there must be a voltage to cause that current to flow. A voltage can cause that current to flow in only one direction in a conductor at a time.

Mr. Branch: Will you read my question, please Mr. [*1869*] Reporter?

(Question read by the reporter).

By Mr. Branch: *Q* Will you now answer that question? *A* I did answer that question.

Trial Examiner: I don't think the answer is responsive to that question. It is simply a repetition of a statement.

The Witness: I fail to understand you. I was asked what study I have made and I stated my study of electrical engineering had given me a series of facts that enabled me to state that.

Trial Examiner: I still don't think that you fully understand the question. Perhaps respondent's counsel may clarify his purpose by further questions, if he feels that the answer is not responsive.

Mr. Branch: I didn't hear your remarks, sir. If you told him to answer the question I don't care about hearing them.

Trial Examiner: He feels that he has answered the question.

By Mr. Branch: *Q* Is that the only answer you can give, Mr. Miller?

Mr. Wahrenbrock: Mr. Examiner, I must object to this line of

inquiry on the ground that I have already stated, that it goes beyond the scope of proper cross-examination of this witness. I am willing that it be pursued, but as direct examination, which it is.

Trial Examiner: It is an examination of the basis of the [*1870*] exhibits prepared by the witness. You should not complain if respondent's counsel desires to qualify a witness as an expert for you. You may proceed, Mr. Branch.

Mr. Branch: I thought he qualified him as an expert, or tried to, and it seems to me that this goes directly to that.

Trial Examiner: I think counsel may be mistaken on that. I did not so understand it.

By Mr. Branch: *Q* Mr. Miller, until you came to the Federal Power Commission, did you ever attempt to ascertain from what particular source a load was supplied, where there were several generating plants connected with the conductors which led to the load? *A* No.

* * * * * * [*1871*]

Q Is it not true that the engineering profession never found it necessary to study the question of what particular source supplied a particular load where there were two generating plants connected with the conductor which went to that load, until the Federal Power Commission started the kind of studies that are presented here? *A* Your question does not permit of a direct "yes" or "no" answer, Mr. Branch.

Q As far as you know, is that not true? *A* Even with that qualification I have got to explain, and I can answer your question substantially in the affirmative, but I think the importance of knowing which particular generators supplied which particular load became a matter of importance immediately subsequent to the passage of the Federal Power Act, not necessarily only since the time the Federal Power Commission started these studies, but prior to the passage of the Federal Power Act the engineers did not have to concern themselves with which generator supplied which load. Yet, in actual operation, the designs and the sizes

chosen for their transmission line conductors indicated that they did ascribe certain loads to certain sources.

Q You have spoken about the passage of the Federal Power Act. I assume you mean the passage of those parts of the act which became effective in August, 1935, do you not? [*1872*] *A* I do.

* * * * * * [*1873*]

Q Have you ever conducted any experiments yourself to ascertain the answer to this problem? *A* May I have the whole question?

Trial Examiner: This is the question that he is now asking you. He has changed the question now.

Will you read this last question to the witness?

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: The question is not clear to me.

Trial Examiner: I think perhaps if you will repeat what you meant by the problem—I think you have already stated it to Commission's counsel, but it doesn't appear in the question.

By Mr. Branch: *Q* Of tracing a source of energy supplied to a load, where the load was connected with two or more generating plants. *A* No.

* * * * * * [*1877*]

Q Leave out of consideration for the minute the particular times when you conclude that Hartford was not delivering energy to the South Meadow plant. Except for those hours, are you able to say that there was any hour in the 321 days when the delivery of electric energy by Hartford to South Meadow was less than the combined loads of Bristol, Winsted, and East Hampton? *A* I have before me Saturday, November 26, 1938, and I note here that on the hour ending 8:00 P.M. of that day—wait a minute—the hour ending 5:00 P.M. of that day, 4,000 kilowatt hours were received at South Meadow from The Hartford Electric Light Company, and the Bristol load alone was 6,000.

Take the hour ending 9:00 A.M. of that day, and there [*1878*]

was received 4,000 kilowatt hours from The Hartford Electric Light Company, and the Bristol load was 9,000 kilowatt hours. So that it is apparent even when Hartford is delivering energy to South Meadow substation, the amount of its delivery is less in many cases than the loads at these various points.

Q You say in many cases. I don't suppose you can tell how many cases that is so? *A* No, I couldn't do that.

Q The illustration you gave us for one of these 21 days, was it not, Mr. Miller? *A* Yes, sir.

Q As I understand it, outside of what is shown in this exhibit, you are unable to give me any answer to the question I asked? *A* You made your question awful broad. I have stated that while I have not the figures for other days, I did note in examining the log sheets that there were many occasions when Hartford was receiving energy from South Meadow, and there were other occasions when Hartford was delivering small amounts of energy to South Meadow. So that my knowledge goes beyond the 21 days shown in this table.

* * * * * * [*1879*]

Q Yes, Mr. Miller, I will be just as specific as you want. You seem to be able to understand, I think. Let us take one of the situations where you have said electric energy was delivered to the C.P. Lines at South Meadow from Massachusetts and at the same time energy was delivered to those lines from the generating plant of The Hartford Electric Light Company. Is that specific enough to enable you to understand what I mean? *A* Then you mean the energy passes along the C.P. lines to the various loads?

Q Well, I want to know what happens after they meet. [*1880*]

A I see.

Mr. Wahrenbrock: Mr. Examiner, there are certain assumptions as to physical principles involved in the very wording of the question "when they meet". I don't know what "they" is that meet.

Trial Examiner: I think it is clear, Mr. Wahrenbrock, what "they" is.

Mr. Branch: I will put "on a common conductor". There seems to be a great unwillingness to understand.

Trial Examiner: There seems to be some question as to whether there was any particular connotation in the word "meet". That seems to be more questionable.

By Mr. Branch: *Q* All right, when they are both put on the same time conductor at the same time. *A* Energy cannot be identified, that is, energy from two sources cannot be identified in any manner by our senses. We have no physical sense that enables us to identify and classify energy and say "This energy comes from Massachusetts" and "This energy comes from Connecticut". We know from the facts concerning generation of energy at a generator, and the facts concerning consumption at a load and laws relating to the flow of currents along conductors, that there is a flow of energy. The question arises, when energy from two sources is put on, as you say, a common conductor, to supply loads along [*1881*] the line of which that conductor is part of the circuit, exactly what relationship there is between energy from one source and energy from another source.

The energy from each source will be delivered to the loads along that conductor in the proportions that the total energy delivered to the conductor or to the circuit, according to the relationships of each source to the total energy delivered to that conductor, so that, as I said in my statement in direct, I believe that the energy delivered to various points along the C.P.1 and C.P.2 lines will have been energy from both sources approximately in the ratio that the energy from both sources was delivered to the South Meadow substation.

Q Well, you have stated a conclusion. Will you tell me upon what observation or knowledge that conclusion is based?

Mr. Wahrenbrock: Mr. Examiner, the same objection, of course, as to this. I put on a separate witness to prove the principles.

Trial Examiner: The objection will be overruled. It is part of the examination, the background of the testimony of the witness.

A Since, as I have stated, there is no way of tagging individual

units of energy, and yet we find that energy does flow, it becomes necessary to examine the types of flow that occur among things that we can see.

[*1882*] We can observe the flow of water. We can, necessarily using different dyes, watch the flow of water. We can by means of smoke, watch the flow of gases, and by using two materials of different kinds, observe how they would flow.

We are dealing in a circuit such as these with conductors which are relatively long with respect to their cross-sectional dimensions, and in that case the flow is similar to the flow of fluids in a pipe, and whether or not there is any definite connection between the generating source and a load with regard to a particular bit of energy, or whether or not there is a complete intermingling of energy along that conductor, our experience would indicate that the same proportions would hold as hold in the case of material things that we can actually see.

Q Well, you say your experience would indicate that. How have you been able to determine that is so? *A* I have never conducted special experiments, but certainly I have seen liquids from several sources mixed together.

Q I am not talking about liquids which you can color. You can't color electric energy, can you? *A* No, but I have stated that we do know that the flow of energy is similar to the flow of other things, and therefore we can certainly apply our experience in other matters to a thing that we can't see.

[*1883*] *Q* How do you know that the flow of energy is similar to the flow of water? *A* Well, I can best give it to you by an analogy. We know that energy is delivered at a source, it passes along a conductor and is delivered to a load. We know that we put water into a pipe at the reservoir, and pass it along to the tap in a house. It is exactly the same idea of flow involved there.

Q And that is the only basis you have for your conclusion, is it? *A* Why do you put it "the only basis"? I don't know what the connotation there is.

Q Have you any other basis for your conclusion than the analogy of water that is colored? *A* You could do the same thing if you mixed cement and sand. We see every day cement and sand mixed together to make concrete, cement, sand and stone, and they are three different materials, and they are put into pipes and into these various mixing containers and mixed together. There are any number of times in our experience we see things being mixed together.

Q Those are all tangible things that you can see, aren't they? *A* I have stated you can't see energy.

Q Have you any other basis for your statement other than [*1884*] what is based upon tangible materials such as you have mentioned? *A* That is all the basis I have.

Q Will you turn to your sheets for May 26th, 1941, on Exhibit 61.

Mr. Wahrenbrock: What was the date, please?

Trial Examiner: May 26th, 1941, Mr. Wahrenbrock.

By Mr. Branch: *Q* I take this by way of illustration and there may be other days, of course, upon which the figures differ.

Let us take the first hour there, 8:00 A.M. Your table indicates that you have concluded that there was received from Massachusetts 3,000 kilowatt-hours, and from The Hartford Electric Light Company 24,000 kilowatt-hours. Those receipts being by the substation at South Meadow. That is correct, is it not? *A* That is right.

Q Now, what would you say that Bristol received during that hour? *A* Bristol received 14,000 kilowatt-hours.

Q What would you say would be the source of supply of that 14,000 kilowatt-hours? *A* Part from Massachusetts and part from the system of The Hartford Electric Light Company.

[*1885*] *Q* You do not know, do you, at what times during the hour that 3,000 kilowatt receipt came in? *A* No, I don't.

Q Is it not possible that it all came in during a certain fifteen minutes of that hour? *A* It is possible, but not probable.

Q It is possible, though? *A* Yes, but not probable.

Q And is it not possible that the Bristol load of 14,000 kilowatt hours all occur during, say, the last forty-five minutes of that hour? *A* No.

Q Why not? *A* It would require that every electrical device that connected to the load of The Connecticut Light and Power Company in Bristol would be disconnected and not taking energy during the first quarter of an hour.

Q The point is this: You cannot say, can you, what part of the Bristol 14,000 kilowatt hours came from Massachusetts, and what part came from Hartford, even according to your theory? *A* I can in this way, that, if you will note the other hours given immediately after that hour ending 8:00 A.M., that there was a fairly steady flow of energy from Massachusetts to South Meadow over the period of hours, and any theory as to [*1886*] its occurring during a fifteen-minute period would require very rapid fluctuations that do not appear reasonable.

Q But in order to make any accurate analysis as to what any particular load received, you would have to know what the load was at the particular instant, wouldn't you? *A* If I was determining what the source of energy to a particular load at a particular instant is, I would have to know the amount of load and the amount of energy being delivered from each source.

Q Doing this on an hourly basis means merely some kind of an approximation, doesn't it? *A* I wouldn't consider it an approximation, no.

Q What would you say as to those 14,000 kilowatt hours which were delivered at Bristol? Would you say that 24/27's of it came from Hartford, and that 3/27's came from Massachusetts? *A* Possibly that, yes.

Q You have not considered the Middletown load, have you? *A* I don't see why the Middletown load enters into your question particularly.

Q Well, between South Meadow and Bristol, there is a Middletown division which presumably has a load? *A* Yes.

Q And that load would be supplied, would it not, from this source or these sources? [*1887*] *A* Yes.

Q And how can you say that all of this 3,000 kilowatt hours from Massachusetts was not delivered to the Middletown load? *A* Because the data indicates that—no, it goes right back to my previous answer. In order that that entire 3,000 kilowatt hours should be delivered to Middletown only, it would require, as I have stated, that during the period of delivery of 3,000 kilowatt hours, that the Bristol district should have been disconnected from all sources of electric energy, and I don't believe anyone would accept that as reasonable.

Q I am not asking you to accept that. I am asking you what basis you have for attributing any of that 3,000 kilowatt hours which you say came from Massachusetts to Bristol, in view of the fact, which I understand to be a fact, that the Middletown load would have been more than 2,000 kilowatt hours. *A* During the hour?

Q Yes. *A* Even if it were, energy from both Massachusetts and from Hartford was received at South Meadow substation during that hour, and passed out on to the CP1 and CP2 lines, and all loads supplied from the South Meadow end of the CP1 and CP2 lines would have energy from both those sources delivered during that hour.

Q That is all based on your theory or your assumption that the proportions remain the same throughout, is it not? [*1888*] *A* It is based on my explanation that I have given to you before.

Q It is true, is it not, that you do not know what happens to the energy from Massachusetts and from Hartford under conditions which you postulated, whether they mingle or run along side by side. *A* I have stated there is no reason of identifying energy units from different sources, so I certainly cannot postulate for you that they either run along side by side or mingle. But the fact does remain that whichever they do, each load will get energy from each source in proportion that each source is delivering energy.

Q Well, isn't it true that when you put energy from two sources on a common conductor at the same time, the identity of the energy from each source is entirely lost? *A* Yes, the identity of each individual unit is lost, but it still does not prevent us from knowing that energy from each source is being delivered to each load.

Q Now, you have based your conclusion and reasoning on analogy to water, among others. Do you consider such reasoning by analogy is a valid scientific basis for establishing a conclusion where the use of the analogy requires nothing beyond the actual experiment or experience?

Mr. Wahrenbrock: May I have that question read, Mr. Examiner?

[*1889*] Trial Examiner: The question will be read for the benefit of counsel for the Commission.

(Whereupon the last question as above recorded, was read by the reporter.)

Mr. Branch: I am sorry, if I said the words you read, I didn't say what I intended to say. May I reframe the question?

Trial Examiner: You may reframe the question.

By Mr. Branch: *Q* Do you consider reasoning by analogy a valid scientific basis for establishing a conclusion where the use of the analogy requires going beyond the actual experiment or experience? *A* The question is very very vague. Words are used that are very difficult to—

Trial Examiner: Do you now understand the question?

The Witness: I could think of a half dozen questions it might mean. I don't know which one it does mean.

Mr. Branch: Nobody here of our scientific men seems to have any difficulty understanding it, but if Mr. Miller doesn't understand, we will try to rephrase it.

By Mr. Branch: *Q* Is it not a scientific principle that analogies hold or are good only when the similarity between the two matters is established? *A* Yes, analogies are only good when there is similarity.

[*1890*] *Q* Now, as I understand it, you have said that the analogy between the flow of electric energy and other more tangible physical flows is the only basis you have for the justification of your theory of allocating energy from particular sources to particular loads; that is correct, is it not? *A* I have stated that. I believe I have limited my analogy to the flow in conductors which are relatively long with respect to their cross sectional area, and therefore closely approximate the flow of things in long pipes.

Q How do you know it does? *A* Purely from the fact that a conductor in general has—such as the conductors, say, at South Meadow—their dimensions are long in respect to their cross sectional area. Then take the circuits from South Meadow substation to The Hartford Electric Light Company. They certainly —they are conductors of the ordinary shape and size, and energy has to flow along those conductors, and physically they resemble long pipes in which materials are flown.

Q Pipes are hollow, aren't they? *A* Well, the question of hollowness doesn't enter into electrical circuits, apparently, for solid conductors can act as a hollow pipe for energy.

Q Do you understand that energy flows only inside of the conductor? *A* There seems to be no generally accepted theory as to [*1891*] how the energy flows. There have been various theories advanced, but the practical working concept is that the energy flows in the conductor.

* * * * * * [*1896*]

Mr. Wahrenbrock: Mr. Examiner, if respondent's counsel will permit the use of the copy which I furnished them for that purpose, I should like at this time to offer in evidence Exhibits 64 and 65 for Identification.

Mr. Branch: Well, they have been referred to. It seems to me they don't add much to the picture, because it does appear that the witness is indefinite as to the hours of those days or how many hours there are.

Trial Examiner: However, they do furnish some information from which any one might make an investigation of other exhibits, if there are any, as to what happened on those particular days.

Mr. Branch: I am going to take the position of objecting until something more appears. They are marked for identification, and it would seem to me—

Trial Examiner: I don't recall at the present time whether any of the log sheets are in evidence or not.

Mr. Wahrenbrock: None of the log sheets are in evidence.

Trial Examiner: It seems to me that in any event these may be admissible, if counsel desires to offer any further exhibits. There is no objection as to the fact that this exhibit was originally introduced and marked for identification on behalf of respondent's counsel, is there?

Mr. Branch: Oh, no.

[*1897*] Trial Examiner: In that event, the Trial Examiner will rule that Exhibits 64 and 65 are admitted in evidence.

Mr. Branch: And my exception is automatic.

Trial Examiner: Your exception will be noted.

* * * * * *

(Exhibits 64 and 65 for Identification received in evidence as Exhibits 64 and 65.)

Mr. Wahrenbrock: I note that Exhibits 61 and 62 for Identification have not been offered. I therefore offer them at this time.

Trial Examiner: Is there any objection to the offer?

Mr. Branch: My objection to the offer is that there is not a proper basis for offering them. I wish to state that [*1898*] that is not based upon the absence of the log sheets, or fundamental data at that time, because I feel that I have an understanding with Mr. Wahrenbrock in regard to what I may wish to do, which of course will apply to him, that those things need not be produced. I object, and I want to make it clear that that is not the basis of

my objection, but I do object on the ground that otherwise proper foundation has not been laid.

Trial Examiner: It seems to me that the manner of their preparation has been established, and any questions raised in rebuttal would be explanatory.

The Trial Examiner rules that Exhibits 61 and 62 may be admitted in evidence.

Do you desire an exception noted?

Mr. Branch: Yes, sir.

Trial Examiner: Exception will be noted for the respondent.

Mr. Branch: I understood that was done automatically.

Trial Examiner: Not automatically in the case of exhibits. I would suggest in the case of admission of exhibits that a separate exception be asked for.

(Exhibits 61 and 62 for Identification received in evidence as Exhibits 61 and 62.)

Redirect Examination by Mr. WAHRENBROCK.

Q Mr. Miller, did you, in selecting the 321 days to [*1899*] which you have referred in your earlier testimony, and which you have listed in Exhibits 64 and 65, make any effort to include in those 321 days, all days on which flows of the kinds illustrated by Diagrams G and H occurred? *A* No.

Q Were there other days not included in those 321 days during which such flows illustrated by diagrams G and H of Exhibit 62 occurred? *A* Yes. My notes indicate that there were probably 280 days when flow conditions illustrated by flow diagrams G and H occurred.

Q Do I understand that those 280 days are other days than those listed on Exhibits 64 and 65? *A* Yes.

Q In addition to the 321 days listed on Exhibits 64 and 65, and the approximately 280 days to which you have just referred, were there yet other days on which there occurred flows of Massachusetts energy to one or more points of delivery from The Connecti-

cut Power Company to The Connecticut Light and Power Company from the C.P. 1 and C.P. 2 lines, not included in the approximately 600 days?

Mr. Branch: I will object to that. That calls for a conclusion which must be based on a number of different calculations and assumptions, and it doesn't appear that work has been done, or at least the work isn't here, or the basis [*1900*] for that conclusion isn't here. I object.

If counsel for the Commission can prove his case that way, all he needs to do is to have the witness come in and say he has found many days or at least a certain number of days, on which Massachusetts energy flowed into Connecticut, and then got to our plants. Obviously we can't be bound by that kind of testimony.

Trial Examiner: I think the question goes beyond the proper scope of redirect here.

Mr. Wahrenbrock: Mr. Examiner, may I be heard on that?

Trial Examiner: You may.

Mr. Wahrenbrock: On cross examination, respondent's counsel has asked a lot of questions which, as framed by respondent's counsel, seem to assume that certain of the flow conditions to which the witness testified on direct examination were limited to 321 days or to some smaller number of days. I wish to clarify any ambiguity of the record in that regard in order to bring out what was testified to by the witness on direct examination, that these 321 days were not the only days.

Mr. Branch: I think I confined my cross-examination to the 321 days.

Mr. Wahrenbrock: Mr. Examiner, I definitely recall the number of 1,600.

Trial Examiner: The number 1,600 days was used and referred to the matter of the 321.

[*1901*] Mr. Wahrenbrock: And there was an effort to bring out a ratio between them which was, I am about to prove, entirely erroneous in its implication.

Mr. Branch: Well, the 1,600 days, sir, were merely the period

which was covered by the figuring of the 21 days. I didn't inquire about those other days, as I recall it.

Trial Examiner: The implication of the question, as I recall it, was that there was a question as to whether it was 321 and what portion of the 1,600 that was. I think that may well be within the scope of redirect, but I would suggest that counsel does build some of the background on which the statement is to be made.

Mr. Wahrenbrock: In that connection I would refer to the witness's description of his study, the data studied, of his method of examining the data, in order to ascertain certain particular facts. I will now ask the preliminary question:

By Mr. Wahrenbrock: *Q* In the course of your study of the data, while you were selecting the 321 days which are listed in Exhibit 64 and 65, did you observe that on other days flow conditions occurred whereunder Massachusetts energy would be delivered to one or more points of delivery by The Connecticut Power Company to The Connecticut Power and Light Company on the C.P. 1 and C.P. 2 lines?

[*1902*] Mr. Branch: I object to that.

Trial Examiner: I think, Mr. Branch, it is understood that it would be upon the basis of the theory which he has already explained.

The Witness: Yes, I have stated—

Mr. Wahrenbrock: If I may ask a further question.

By Mr. Wahrenbrock: *Q* Does that complete your response to that question? *A* No, I am trying to explain.

Q Will you do so, please? *A* I have stated that I examined the Connecticut Valley Power Exchange sheets to determine what information I needed in order to establish the flow of Massachusetts energy to C.P. 1 and C.P. 2 lines, and therefore, to loads along those lines. I stated that the 321 days were based on the facts that they had hours when generation at Falls Village was zero or less than the deliveries to Central Hudson Gas and Electric Corporation, simultaneously with the receipt at South Meadow of energy from Massachusetts.

I also stated that I made note of the days when the generation at Falls Village was small, or the generation only exceeded the delivery to Central Hudson Gas and Electric Corporation by a small amount, of the order of about 1,000 kilowatts.

I also stated that I observed the deliveries to Bristol, and there were many hours when I noted that the generation at [*1903*] Falls Village was less than the delivery to Bristol when the Massachusetts energy was received at South Meadow.

I also noted hours when the delivery, when the difference between the generation at Falls Village and the deliveries to Central Hudson Gas and Electric Corporation were less than the deliveries to Bristol, making it apparent that Bristol could not have been supplied entirely from Falls Village generation, and therefore Massachusetts energy received at South Meadow must have been delivered in part to Bristol. I further noticed on those log sheets—

Q May I interrupt to ask if those instances to which you have just asked referred to the 280 instances you previously referred to?

Mr. Branch: I object to that question. I am going to ask to have the answer to the last question stricken out and also as appearing to be based on information which the witness is not presenting.

* * * * * * [*1904*]

Mr. Wahrenbrock: Do I understand that respondent's counsel wants the witness to bring in the work sheets? I don't understand the question.

Trial Examiner: As I understand, there was a motion to strike.

Mr. Branch: Yes, sir. It seems to me it is one thing when the witness comes in here with some figures, and I want to make it clear here again that I am not objecting because the log sheets and so forth are not produced, but to have a general kind of a statement like this as to what was found, without any more indication than the witness has given, it seems to me to be entirely improper.

Mr. Wahrenbrock: Mr. Examiner, we have established the pattern by Exhibits 61 and 62. We have referred in the testimony that has been introduced to particular types of flow. Then the witness says that on 280 days he found one of those types of flow. And now I am asking him to state further whether he found further types of flow on other days. Now, the statement couldn't be any more definite and yet cover that much ground.

Mr. Branch: That is what I object to, his covering the ground in that way.

Mr. Wahrenbrock: I understood you to object to stating the number of days the flow occurred. I would object too if I thought that I had any grounds for objecting.

[*1905*] Trial Examiner: Mr. Wahrenbrock, that statement is out of order. Counsel will address the presiding officer in all cases.

However, it does not appear that this is improper matter for redirect examination. The objection is overruled and the motion to strike is refused.

* * * * * * [*1906*]

Q Permit me to interrupt. The question is whether the 280 days you previously referred to were the same or were different days from those—

Trial Examiner: What were the days you have just referred to here?

The Witness: My reference to the days when the Falls Village generation was less than the deliveries to Bristol or to Falls Village, generation minus the deliveries to Central Hudson Gas and Electric Corporation were less than the [*1907*] deliveries to Bristol, referred to the 280 days, and I was completing my statement by further stating that I had noticed that even during hours when the generation at Falls Village was of the order of, you might say, full capacity, that on certain days energy was received at South Meadow substation, and simultaneously the log sheets indicated delivery from South Meadow to the CP1 and CP2 lines.

which energy proceeded to loads along those lines, the exact points of which I would not be able to determine, although the first load, being Middletown, it is evident that Middletown at least would have received energy during those hours. I did not make any attempt in this last case to make any notations as to the particular days.

Mr. Branch: I ask that the answer be stricken on the ground I have indicated, by the witness's own admission.

Mr. Wahrenbrock: Well, Mr. Examiner, that corresponds with nothing in the statement that has been made. There is certainly in that statement nothing which can be characterized as an admission on which such an objection could be made. It is obvious—

Mr. Branch: May I hear that statement of counsel.

Trial Examiner: The reporter will read the remarks of counsel for the Commission.

Mr. Branch: The admission was that he had not noted the days, the very matter of which I complain.

[*1908*] Trial Examiner: I think that the answer can stand. That would go only to the weight. The question and answer will remain, and the motion to strike is overruled.

Note an exception for the respondent.

Mr. Wahrenbrock: Mr. Examiner, as the remainder of my statement is not on the record, and there might be some inference from the record as recorded, I would like to clear it. The rest of my statement was, it was obvious on the face of it.

Trial Examiner: All right, with that explanation. I don't think that was the part that was being objected to.

By Mr. Wahrenbrock: *Q* Mr. Miller, did the several types of flow conditions illustrated in Exhibit 62, occur only on the 21 days shown in Exhibit No. 61? *A* No. They occurred on the days included in the 321—one or more of those conditions of flow occurred on the 321 days that I have previously given lists of.

Q Are all of the types of flow conditions which occurred during the hours shown in Exhibit 61 illustrated by the flow diagrams in Exhibit 62? *A* Yes. The flow conditions existing during the hours shown in Exhibit 61 are illustrated by flow diagrams shown in Exhibit 62.

* * * * * * * [*1909*]

Q Are any flow conditions illustrated in Exhibit 62 which did not occur on some one or other of the days shown in Exhibit 61? *A* No.

Q In your cross-examination, how did you understand the question asked you in the following language, and I now quote from the transcript, page 1864:

> "*Q* I want to know if this is a correct statement: Your flow diagrams which are in evidence as Exhibit 62 show only the situations which existed in those hours which are listed in 61; is that correct?"

A I interpreted that question to mean that the flow diagrams showed, one or more of them showed all—illustrated all the flow conditions existing during the hours for the 21 days in Exhibit 61. But I did not interpret it, as it appears to me now, to mean that the flow conditions illustrated by flow diagram, Exhibit 62, did not occur on other days.

* * * * * * [*1910*]

PERCY H. THOMAS,

previously sworn, resumed his testimony:

Cross Examination by Mr. BRANCH.

Q Mr. Thomas, in relating your biography, I don't think you mentioned the period of your service with the Federal Power Commission. Will you bring your biographical sketch up to date in that respect? *A* I joined the staff of the National Power Survey, I think it was February 12, 1934, as chief of the Division of Power Requirements, I think. And I held that position until the completion of the work of the National Power Survey.

at which time I was appointed Regional Director of the Second Administrative Region of the Commission, with headquarters at Atlanta, and I still hold that position.

Q And you have then since about 1935 been Regional Director of the division with headquarters at Atlanta? *A* That was 1937. The National Power Survey continued for two years, or a year and a half, perhaps, after which I went with the Commission.

Q Are your duties as such Regional Director normally [*1911*] confined to the region in which Atlanta is located? *A* Well, if you mean by normally usually, I will say yes; but occasionally the Commission assigns me duties which take me outside of that area.

[*1912*] Mr. Branch: I want to ask you a few questions in regard to your testimony.

By Mr. Branch: *Q* In alternating current circuits, with loads such as we are considering in this case, does reactive or out-of-phase current ever flow? *A* Well, that is a very general question. As I understand it, it does.

Q Is the flow of such current an unusual or a usual occurrence? *A* I would say it was a usual occurrence, speaking generally.

Q And is there also a flow of in-phase current? *A* There often is.

Q Do these two flows, the in-phase, and the out-of-phase, occur in the same circuits at the same time? *A* A resultant current flows in the circuit which represents the two types.

Q Doess the out-of-phase current always flow in the same direction as the in-phase current at the same time? *A* Your question is very general, without giving a basis for the relation to the phases, but it is true that—

Mr. Wahrenbrock: Mr. Examiner—

Mr. Branch: I suggest that the witness be allowed to answer the question.

[*1913*] Trial Examiner: I think the witness may be allowed to complete his answer.

Mr. Wahrenbrock: Well, I object to the question.

Trial Examiner: On what grounds?

Mr. Wahrenbrock: It hasn't stated sufficient facts to enable an answer.

Mr. Branch: Mr. Examiner, I have been pretty patient, I think, but it seems to me that where the Commission's own witness goes ahead and starts answering the question, it is highly improper for Commission's counsel to interrupt him and object that there isn't sufficient basis, when the witness evidently found sufficient basis.

Trial Examiner: I think that the fact that the witness proceeded to answer indicates that there is sufficient basis. The witness may proceed. The objection is overruled.

A It is of course not true that at any instant of time current flows both ways in any particular circuit, but in considering what we call effective values, it is true that there come times in circuits when as a result of the voltage and current flow we get a balance which would be produced if we will say reactive energy flowed in one direction and true energy flowed in the other direction. I can't make you a very "Yes" or "No" answer, because the terms of your question are exceedingly broad.

By Mr. Branch: *Q* Is it not true, therefore, that the in-phase current [*1914*] and the out-of-phase current flows simultaneously in the same conductor? *A* I have said that there is a resultant current which in a sense represents the two. There are no two currents separately flowing in the conductor at the same instant of time.

Q Is the in-phase—is the power flow in a circuit given by the product of the voltage and in-phase current, using effective values, as you pointed out yesterday? *A* Well, am I to assume that you mean a circuit in which the power is flowing at a unity power factor, when you say "in-phase current"? I assume that is what you mean.

Q In phase with the voltage in that circuit. *A* Well, in that case the energy is the product of the voltage and the current effective values.

Q And is that power often called active power to distinguish it from reactive power? *A* I think that term is often used for that purpose.

Q Is the reactive power flow given by the product of the voltage and the out-of-phase current, using effective values? *A* If you have a circuit in which there is an out-of-phase flow of current, I mean one in which the power factor is zero, the reactive k.v.a. as it is commonly called, is the product of the voltage and the current.

[*1915*] *Q* Is reactive power flow given by the product of the voltage and the reactive or out-of-phase current, using effective values, when there is also in-phase current? *A* Well, for purposes of analysis, as a convenience, engineers sometimes think of a current in terms of two currents which might make up that current, and when it is worth while they may consider those currents separately as a convenience in calculations. I wouldn't answer the question the same way with regard to the physical conditions existing in the circuit itself.

Q These flows of active power and reactive power occur simultaneously on the same conductors? *A* If you set up a condition which would produce reactive flow in a certain conductor, and at the same time set up another flow that would cause an in-phase flow, and apply the two simultaneously, you will get a net result which for some purposes is the same, I mean you get a numerical result, you get a conclusion of the same effect showing what would have been accomplished if they could have flowed separately at the same time. It is convenient sometimes to look at them as though they did. As a matter of fact, of course, they don't flow simultaneously and in opposite directions in the same circuit.

Q I am going to use the term "direction" in the accepted sense employed by engineers concerned in electric power systems.

[*1916*] Are the flows of active and reactive power which occur simultaneously in the same or in opposite directions?

Mr. Wahrenbrock: Mr. Examiner, I object, unless there is a showing of the basis for the usage.

Trial Examiner: I believe the witness has stated that they did not occur simultaneously, and I think that the question says "which occur simultaneously".

Mr. Branch: Well, I mean simultaneously, in the sense that the witness has expressed it.

Trial Examiner: All right. The witness may answer the question.

A As a matter of convenience it is sometimes quicker to assume that the two are flowing simultaneously, in which case you can take it either way you like, according to what the conditions are; one being flow one way and one the other. That is not the physical fact, however.

By Mr. Branch: If it isn't the physical fact why then is it proper to think of the two components as existing separately?

A Well, it isn't always proper, but I say it often is a convenient matter. It depends on the knowledge and the skill of the man who is doing the work.

Q In the same sense that you have used the word "simultaneous" is there any essential difference physically or scientifically between the simultaneous flows of active power and reactive power on a given line or circuit on the one hand, [*1917*] and the simultaneous flow of two or more components of active power on the other hand.

* * * * * *

A That question doesn't mean anything to me. Could you rephrase it a little differently?

By Mr. Branch: *Q* Is not one justified in thinking of the two or more components of the active power as flowing simultaneously; of two or more components of active power flowing simultaneously? *A* Just what do you have in mind by two or more components of active power? I understand separating the components active and reactive, but just what do you mean by two components of active power?

Q Well, what I had in mind, by way of illustration, anyway, is power on a line that is supplied simultaneously from two different sources. *A* And then what is the question about that line?

* * * * * * [*1918*]

A In that situation, while there is no physical flow simultaneously in opposite directions, it might, for some purposes, be convenient to balance one side against the other. I don't know just what purpose you might have in mind.

* * * * * *

Q Assuming first they are being served in the same direction. *A* Well, there will of course, in that case, be a flow [*1919*] of resultant current. That doesn't seem to be the same matter you were inquiring about before, but my answer covers the fact.

Q All right. Now I will ask you the same questions. Assuming that the two flows are in opposite directions. *A* What will occur is that a current, the resultant of the two, taking into account their directions, will flow in the wire, a single current physically equal to the difference in the two originating in the two ends.

* * * * * *

Q I think in that last answer you used the term "current". Did you mean to use "current"? *A* I think the question said "current". That was my impression.

* * * * * *

A My impression was that "flow" was intended to refer to "current".

By Mr. Branch: *Q* I intended it to refer to power. [*1920*] *A* As I understand it you have been talking about active power, and I don't see that that would change the answer.

Q Your answer as to current would be the same if the question applied to the flows of power? *A* Changing the word "current" to "power"—yes.

Q Now, I think you have said in effect that it is a common thing for a circuit to contain a flow of reactive volt amperes or

out-of-phase current, which I understand is a similar thing, at the same time that there is a flow of active power. That is correct, is it not? *A* I didn't state it that way. A resultant flow of energy or current will occur which for some purposes, particularly with regard to the terminals, will have the same effect as though they flowed simultaneously. That effect will be quite different in the conductor itself, though,—in a transmission line connecting the points, the terminals of flow. I am speaking generally, and I want to be understood that I have no definite condition set before me.

Q It is possible to measure the reactive volt amperes, is it not, on a circuit? *A* That is regularly done.

Q And with your familiarity with this system, you know that there are such meters on the lines of The Connecticut Power Company, designated as C.P. 1 and 2, or the South Meadow substation of that Company? [*1921*] *A* I believe there are. I would caution you that in speaking of the measurement of the r.v.a., out-of-phase current, I am using that convention I spoke of by which engineers analyze a current into components, for the purposes of their convenience, not that there is a separate r. v. a. current flowing in that circuit, separate from the other.

Q Well, it is something that is measured separately, is it not? *A* The component of the total current which is called the out-of-phase component, is measured that way, yes.

Q And it is measured separately from the power, is it not? *A* Well, the meter indicates what that component would be. I don't know what you mean by "measured separately". It indicates that component as though there were no other component.

[*1922*] *Q* You measure reactive volt amperes on one meter, do you not? *A* Yes, that explains the situation. You do. My answer is yes.

Q Power is measured on a separate set of instruments, is it not? *A* Ordinarily, yes.

Q Now, Mr. Thomas, you gave certain answers in regard to the action of transformers. As I understand it, you said substan-

tially that there was no appreciable difference in the amount of energy which entered and left the transformer. Is that correct? *A* With the exception of the exciting energy and losses, that is, correct.

Q Which would amount to about what? *A* Well, in those power transformers we are talking about, my very rough estimate is less than two per cent for the actual losses, probably considerably less than that for the magnetizing energy.

Q Is not the same thing true with respect to the prime mover or the generator of electric energy? *A* Well, could I ask you to state what you mean by the same thing. There is quite a difference between the generator and the transformer.

Q I will confine my question to the generator. [*1923*] *A* You ask if the same thing is true?

Q Yes. *A* You mean that the energy that comes in and goes out is the same except for loss in exciting energy?

Q Of a negligible amount. *A* In broad terms, I think that is true.

Q I think you testified that there was no delay in the movement or transfer of energy, as I think you put it, in a transformer. Now, is there any delay in transferring the energy in the generator, from mechanical to electrical energy? *A* They are both substantially simultaneous, except that I would like to point out this difference, that in the case of the transformer, the exciting energy is alternating and goes in and out in a definite regime with regard to the voltage, and there is a certain regime in the flow in and out of the exciting energy of the transformer. In the generator, the ordinary type of generator, the exciting energy is represented by a field which is supported by direct current, and there is no flow in and out except when the generator is first excited and when it is next de-energized.

Q I think you said that no energy was stored in appreciable amounts in a transformer. Is any energy stored in appreciable amounts in the generator? *A* The condition is somewhat different. There is, of course, the fly wheel effect in the generator.

[*1924*] I don't know whether you had that in mind or not. There is quite an appreciable amount stored in the fly wheel effect of the generator.

Q Is it stored in such measure as to be available for commercial utilization? *A* Well, it is relied upon very heavily for stability of operation in large systems, if that is what your question inquires about.

Q Can that supply of energy be called upon for any appreciable time? *A* It can be called upon under proper circumstances until it is exhausted.

Q What is the ordinary time within which it is exhausted? *A* Oh, within a very short space of time. A few seconds, perhaps in an ordinary commercial system. That is a very general answer. You would have to give me more information.

Q Wouldn't it be a fraction of a second? *A* I say it depends on the numerical constants in the particular case.

Q How long would a machine deliver a full load with a substantial supply of energy from its fly wheel only? *A* A very short time, unless it is some specially designed machine.

Q A fraction of a second? *A* Well, that is hedged about by so many questions as [*1925*] to how much voltage drop could be allowed and still be considered operating, I don't think I could give a better answer.

Q Well, within reasonable frequency limits. *A* I was speaking about voltage drops. As the machine slows down, the voltage becomes lower and lower, and after a while it isn't useful. Now, just at what point would you consider a machine loses its utility?

Q Doesn't the frequency also drop there by causing the machine to lose its utility? *A* You are speaking of frequency in the electric circuit now? The frequency of the alternation of the circuit produced by the generator?

Q Yes. *A* Yes, it soon loses its usefulness.

Q Is it not true that it is not possible to store electric energy in a generator in commercial amounts for any appreciable time?

A If you are considering the function of parallel operation, and steadiness of service, I think it is possible. If you limit your question to the ability or utility of fly-wheel stored energy carrying a load unaided, why, then it isn't feasible commercially to use it for that purpose.

Q I mean the latter. *A* All right.

Q Wouldn't the interruption of the operation of a [*1926*] generator leave the entire system with which it is connected inoperative, assuming there is no other generator attached? *A* If there is no other source of power, that is a fair assumption.

Q And is not the flow of energy continuous and practically instantaneous in a generator? *A* You mean the flow of energy through the armature into the circuit?

Q From mechanical to electrical energy. *A* Yes.

Q Then, in all of those respects, the transformer and generator are substantially alike, are they not? *A* Well, I pointed out in the storing of energy there was a rather essential difference, and also in the nature of the exciting energy. Except for things of that kind, why, the different things you have spoken of occur in both types of apparatus.

Q As far as ability to supply a load in commercial amounts from stored energy, there is no distinction in that respect between a generator and a transformer, is there? *A* I pointed this out carefully. I don't need to change my answer. The question isn't quite definite enough.

Trial Examiner: Will counsel clarify the question for the witness.

By Mr. Branch: [*1927*] *Q* Well, subject to the restrictions which you stipulated, which I am not attempting to get you to change, there is no substantial difference in those respects between a generator and a transformer, is there?

Mr. Wahrenbrock: Mr. Examiner, as so stated, the question is exactly like the preceding question.

Trial Examiner: I don't think so. He has clarified it.

The Witness: Assuming that with regard to the stored energy in the fly-wheel effect of the generator, you are thinking only of the ability of the generator to supply prime power, and my reservation about the field coils, my answer would be in the affirmative.

* * * * * * [*1935*]

Q You have testified, I think, Mr. Thomas, that there were certain principles which underlay the conclusions which Mr. Miller reached in Exhibits 61 and 62. That is correct, is it not? *A* Well, I agreed with some principles. I think they were called, in the questions which seemed to underlie that.

Q And it was necessary to apply those principles in order to reach the conclusions which he reached as expressed in those exhibits, was it not? *A* Well, applying a principle, I would say that they were in line with the ordinary methods of an engineer in arriving at such problems. It hardly arose to the dignity of a principle, as I was using them, in examining Mr. Miller's studies.

[*1936*] *Q* Well, I think you stated, did you not, that one principle that was involved was that there could not be a simultaneous counterflow of energy in conductors such as are involved in circuits that we are interested in here? *A* Yes, that is correct, physically speaking.

Q And that principle is the fundamental basis of all of his conclusions, is it not? *A* I don't know what you mean by "the fundamental basis". Of course it is necessary that there should be no physical counterflow; and that was determined, to be perfectly sure of the conclusions that he reached.

Q If that principle were not applied, in other words, if you assumed just the contrary, Mr. Miller's conclusions would be without basis, would they not? *A* Well, I don't see how you can tell whether they were or not. That situation would have to be reexamined. I would not be prepared to say what the result would be.

Q But your endorsement of his result was dependent upon the validity of that principle, was it not? *A* Well, in checking his

result I assumed that there was no counterflow in that wire, if that answers your question.

Q Yes. But you could not, at least as far as you have gone at the present time, check those results if you assumed just the contrary of that principle, could you? *A* I wouldn't go as far as that. You are assuming [*1937*] something that is contrary to my conception. What the result would be I would have to explore. Just because that particular course of logic didn't satisfy a result doesn't prove that there wouldn't be some other course of logic that would do, as well.

Q You haven't any such course of logic in mind? *A* I didn't go further than I told you.

Q Now, I think that you testified in effect that there were instruments for determining the flow of energy and the rate of flow that you designated as watt-meters or watt-hour meters; is that correct? *A* I remember stating that.

Q Such meters, of course, do not show the source of the energy, do they? *A* Well, the meter itself doesn't have a marking on it to show where it came from. In Mr. Miller's case, the meter doesn't show red and blue or anything of that sort.

Q And of course there is not at Bristol or Winsted or any of the East Hampton District any instrument which shows the source of the energy that was received there at any time? *A* No, not that you can determine from the reading on the instrument.

Q And as a matter of fact it is impossible by examining or by any other observation that you can make of energy at a particular point, to know where it is generated? [*1938*] *A* I think that is correct.

Q And if energy from two sources is put on the same conductor, there is no physical method or experiment by which it may be determined what happens to the energy from the two sources, after they have both reached the conductor, is there?

* * * * * * [*1939*]

The Witness: Well, if I understand the meaning of the question, we do. That is a very common occurrence, and currents from

two sources go on to a circuit and run together, and mix there, and it is distributed. I think perhaps I didn't understand the question.

By Mr. Branch: *Q* I am afraid you did not. What I meant to ask was whether there was any method of physical observation by which you could tell what happened to the distinct sources, or to the energy from the two distinct sources, if energy from two different sources was put on a common conductor such as is involved in this case. *A* You mean what becomes of the energy from source A as distinguished from source B?

Q Yes. *A* I don't think your question brought that out, but I think I see what you mean. Well, if you are referring, to putting on a conductor, there is, energy enters the conductor and is carried through the conductor, and the energy from the two sources having a certain distinction, I think it is fair to say that energies having been mixed and merged, whatever becomes of the energy as a whole, the disposition of it is in equal proportions to those of the two component parts. That is a clumsy answer, I am afraid, but I think you know what I am trying to say.

[*1940*] *Q* Without meaning to criticize you, Mr. Thomas, I don't think you have answered my question, which was whether there was any physical means of determining that. *A* Well, your question is still very indefinite. You haven't stated whether you wished energy from the separate sources identified after they have left the conductor. I think if you will rephrase that question so I can answer it more successfully—

Q Let me ask you a specific question. Let us assume that there is energy put on the CP line No. 1 from Falls Village, and there is also energy put on that line from Hartford. There is no physical observation or no reading of any meter on that line that would enable you to determine at any particular point what proportion of the energy came from one source and what from the other? *A* Well, the instruments that are put on the line are only intended to read the total. So, of course—

Q And the— *A* So, of course, they wouldn't indicate parts. They are not intended for that purpose.

Mr. Wahrenbrock: Mr. Examiner, may the witness have time to complete his answer.

By Mr. Branch: *Q* I am sorry. Had you finished? *A* Yes.

[*1941*] Trial Examiner: Is the witness through with his answer?

The Witness: Yes.

By Mr. Branch: *Q* If I stop you at any time, Mr. Thomas, please tell me, because I don't want to interrupt you. And similarly, if there were a generating plant somewhere north of Hartford that was putting energy on that line, and the Hartford plant was also putting energy on the line, the same answer would be true, would it not? *A* Well, that is substantially the case I had in my mind.

Q In other words, your conclusions as to what happened when energy from two sources is put on such a line is based, is it not, upon analogy with other kinds of flow? *A* I wouldn't say based on analogy exactly. It is based on working hypotheses that engineers have of such things. Engineers have to deal with these matters all the time, and consequently they arrive at a working basis or hypothesis which is proved out by experience. Analogy is helpful and illustrative, but I wouldn't say we depend exactly on analogy.

Q Well, what other basis have you for the opinion which you expressed as to the proportions continuing all along the line, the same proportions as are put on the line? *A* Well, we are dealing there with intangible things, things which cannot be seen or noted directly, and I think we are forced to use these hypotheses, this method of work, which [*1942*] has proved out by experience.

Q Except for the purpose of such studies as are made in this case, it is not necessary or important, is it, to determine what happens in such situations? *A* Of course, it very often is not necessary or important to determine identity of component parts of a current. I wouldn't say it is never important. Sometimes it

occurs, but many problems don't involve that question, you are perfectly right.

Q What kind of a problem would involve that question other than the kind of a problem that arises under this Federal Power Act? *A* I think that question is a little too general to answer Mr. Branch.

Q Can you state any situation, or in any other situation, in which that problem is of any practical importance? *A* Would you mind stating what problem you have in mind now, because we have had some very general statements, and no specific instances. I want to make you a proper answer, and I would like to know just exactly what kind of a problem you have in mind.

Q I am talking about the problem of determining what happens as between energy from one source and energy from another source, where energy from two sources are put upon a common conductor such as the CP1 and 2 lines involved here. [*1943*] My question is, other than for purposes of this case and similar situations, is there any situation in which it has been of practical importance to determine what happens in that kind of a situation? *A* Well, of course, anybody who is examining the physics of those things, studying the theories, investigating for the benefit of the future, or people working in laboratories, studying the distribution of current in conductors, the effect of angles in a wire, or perhaps enlargements of a wire, or many questions of that kind; it would be necessary to investigate, I think, the mechanism by which this mixing occurs. That is a little general, but you are asking me to search around in a very wide field without anything very definite to go after. Perhaps you can ask me something else.

Q Did you yourself ever have occasion to determine the relative proportions of supply at a particular load, a situation similar to this, before you came to the Federal Power Commission? *A* The proportion of supply—you mean now identifying, you might say, by the equivalent of tagging?

Q Yes. *A* I don't remember this minute of any case other than the type of case you are speaking of.

Q And wouldn't you go even further than that and say you are sure there never was such a thing? *A* I wouldn't want to say that. I think probably there has been. I have been working in this field a long while, [*1944*] and you have no idea how many different situations arise.

Q Well, what method of determining that is there? *A* Well now, you mean—

Mr. Wahrenbrock: May we have that question put more specifically? The "that" certainly isn't clear to me as I am trying to follow the question.

Mr. Branch: It seems to me that it is quite clear.

Trial Examiner: I think it is clear to the witness. Does the witness understand what is meant by the question?

The Witness: Well, I think I can answer it. I don't know whether the answer would be satisfactory.

Trial Examiner: You may proceed.

A You mean is there any way of tagging the energy that comes from one source and mixes with another afterwards? I think I should have to say that would be done by inference and experience, rather than by direct observation.

By Mr. Branch: *Q* Well, leave out the inference for a minute, and what experience is there that would demonstrate that? *A* Well, as I said a while ago, engineers are handling these problems, and they work with certain hypotheses and they find they are correct, that they get the right answer, as a matter of experience. Now, isn't that what you mean? That indicates we know it by experience.

Q Well, is there anything in your experience that would negative, for instance, the proposition that if energy were [*1945*] put on a single conductor, such as the C.P. 1 and C.P. 2 lines from Hartford, we will say, from a source north of Hartford, that the energy from the source north of Hartford supplied the first loads until it was consumed and the energy from Hartford supplies the other loads? *A* Are you referring now to the 66 k. v. bus at the

South Meadow station belonging to the C.P. Company? You have introduced a new situation. I want to be sure I understand.

Q I didn't mean to introduce any new situation. Let's assume that there is a bus there that could be energized from Hartford, and also from some generating plant north of Hartford, C. P. Lines 1 and 2 are connected with that bus and there are loads to the west. Is there any experience that you have had that would enable you to say positively that the first loads south and west of Hartford were not supplied with energy from the generator north of Hartford before any of the Hartford energy was supplied to the loads? *A* Well, if I had a full specification of the physical set-up there, there might well be such a situation. There might not be, according to how it is connected.

Q Let's take the situation as it is, with which I understand you are familiar; let's assume that some station north of Hartford generates a certain amount of energy and according to your theory that energy reaches the 66 k. v. bus at South Meadow and at the same time Hartford is generating and some [*1946*] of its energy reaches that same 66 k. v. bus simultaneously. Now, my question is: Have you had any experience that enables you to demonstrate that the first load, which would be Middletown, south of Hartford, is not supplied entirely by the energy which is generated at this generating station north of Hartford? *A* Well, I think I have answered that. I stated in my direct testimony that the energy or the current received in that line would merge and they would be taken off proportionately. I think I have already stated that.

Q I am afraid I don't impress my point. I am not asking for your opinion, which you have made very clear, Mr. Thomas; I am asking you to tell me whether you have had any experience or demonstration from which you can say that the result, which I am assuming, could not occur. *A* I also testified that that is based on the hypothesis which I consider is proved by the experience of engineers. You are asking me if I have made a research of a model of such a situation, to see whether I can demonstrate those things. I would say I never have.

Q That is what I wanted. *A* I have never set up a model and gone through the movements of trying to investigate the currents' action flowing.

Q And you have never had an experience where the current, or where the energy was supplied by Falls Village, we [*1947*] will say, at the other end of the line, and Hartford, simultaneously? *A* Well, I feel that my opinion there is based on experience, as I have described; I never have set up a model of the Falls Village situation and tried it out in an experimental manner to see how it would work. That is true enough.

Q And you have not been called upon in any of the engineering work which you have done at least prior to the time you came to the Federal Power Commission to determine either of those problems as a practical matter, have you? *A* You mean as related to Middletown and Falls Village?

Q Or a similar situation. *A* Well, that is too broad. I don't know what I have done there.

* * * * * *

Q Mr. Thomas, I think you have stated that you had considerable familiarity with the facilities in the four different sections as to which you have testified. Will you tell me exactly what the basis for your familiarity with those systems is? *A* Well, do you mind mentioning the systems, just to avoid any waste of time?

[*1948*] *Q* Well, I think you have testified in regard to Groton, what we call generally the East Hampton Section, the Bristol Section and what we can call the Winsted Section. *A* As to the Groton Section, I visited Trails Corner substation and the Groton high-voltage substation, the Groton brick station and observed the lines around there, and I noted the line to Montauk, the 33 k. v. line to Montauk, in a number of places, and some of the tap-offs, and at Bristol I visited Bristol Mountain.

Q Wait just a minute. May I interrupt you. When did you make this visit to Groton? *A* The latter part of May, this Spring.

Q And up to that time you had not examined those facilities? *A* I had not examined them personally.

Q What was that about this 33,000 volt line to Montauk? *A* Excuse me, Montville, I should have said. There is another station, Montauk, in another place. I misspoke myself.

* * * * * * [*1950*]

Q At the time you made this visit to Groton, that substation which you have just characterized as the Groton-Long Point High-Voltage Substation had been largely dismantled, hadn't it? *A* Yes, I would say so. It wasn't in working order.

Q And there was not a continuous line from Trails Corner to that substation, was there? [*1951*] *A* I didn't visit all the lengths of the line, but I understood there had been some portions of it taken down.

Q Did you go to Trails Corner? *A* Yes.

Q Didn't you see that a large part of the line south or east of there had been removed? *A* I didn't trace the line far from the station. I think you are no doubt right.

Q Did you visit the little station right on the shore at Groton-Long Point? *A* Yes, that is the brick—Groton-Long Point station.

Q And you found that the jumpers had been removed, which connected the underground cable which went to Fishers Island, didn't you? *A* Yes. Generally called the "submarine cable", that went underground.

Q Generally, that substation had been dismantled, in so far as it contained facilities which were in any way used in connection with Fishers Island? *A* I think so.

Q Had you ever visited the facilities at Groton, at any other time? *A* Not that I remember. You said "visited"?

Q Yes. *A* No, I don't remember any other time.

[*1952*] *Q* Did you visit Bristol at or about the same time, May, 1941? *A* Yes.

Q Before we go to Bristol, how about East Hampton, did you go down there? *A* Yes.

Q And at the time you went down there, there was no connection between the G.P. lines and the facilities of The Connecticut Light and Power Company in the East Hampton section, was there? *A* That is correct.

Q Have you ever examined the facilities of The Connecticut Light and Power Company in the East Hampton section before that time? *A* Well, I have been through that section on other occasions a number of times. I never made any special examination of it. I presume I have seen some of the facilities on the roads, but only incidentally, in driving by.

Q And did you go to Bristol at or about the same time? *A* Yes.

Q And did you examine the facilities at Bristol? *A* I did.

Q You have referred in your testimony to synchronous condensers at Bristol. Did you find synchronous condensers at Bristol? [*1953*] *A* There was one synchronous condenser, not two, as I understand it.

Q Then, if you referred to synchronous condensers at Bristol, that was an error, was it not? *A* Well, I was not aware that I had referred to it in the plural. If it should appear that I had specifically referred to more than one synchronous condenser, it was an error.

Q And where was that synchronous condenser at Bristol located? *A* It was in the building, not in the outdoor substation.

Q And everything in that building was on the low-voltage side of the transformer which stepped the energy down from 66 k. v. in the outdoor substation; that is correct, is it not? *A* In the sense that there was no 66 k. v. voltage apparatus in there, I presume that is correct. Of course I didn't examine every corner to see whether there wasn't a line brought in for experimental purposes, or something of that kind, but I would agree with your question, I think.

Q In other words, the energy that went through that condenser at that time was energy at a comparatively low voltage, was it not? *A* The energy at that point was in a low-voltage circuit, yes.

Q Did you find any other condenser anywhere belonging to The Connecticut Light and Power Company? [*1954*] *A* I don't remember now, any belonging to The Connecticut Light and Power Company, except to be very punctillious, the Robertsville generators might have conceivably been used like synchronous condensers, if there was no water and they wanted to operate them for that purpose. I don't think you meant to include that in your question.

Q I was asking you, sir—and you may rest assured that your answer has been thorough. *A* I am glad.

[*1955*] *Q* Now, had you ever examined the facilities at Bristol before this visit? *A* Well, I make about the same kind of an answer. I have been in Bristol before, and I have seen the substation and have seen the lines, but I had made no special effort to examine them.

Q You didn't go to Bristol on Sunday afternoon in the course of a joy ride? *A* I think it may have been Sunday afternoon some time but—

Q What is the location of the Bristol substation in respect to the population center, and so forth? *A* Well, I think you have me stumped there.

Q Well, it is right— *A* It is more or less in the heart of Bristol. There are built up blocks around there, and apparently the feeders go in different directions.

Q Now, did you visit Winsted at or about the same time as you visited these other places? *A* Yes.

Q And that was in May, 1941? *A* That is right.

Q Had you ever examined the facilities of Winsted before that time? *A* I don't remember that I have ever visited in Winsted [*1956*] before, but I possibly may have.

Q Had you ever examined the facilities in Torrington about which you spoke before that time? *A* I had been in Torrington, and I probably have been by the station, but I didn't examine them. I would like to say now I am talking in a physical sense, that I haven't examined them. I am pretty familiar with facilities in the State. I have had occasions to study those systems a number of times, as long as you are limiting your question—

Q I am for the present, and I will give you an opportunity to explain your other sources of knowledge later. But I want to know what physical examination you made. You had never, I take it, examined or seen the particular facilities right in Torrington to which you have referred until you made this visit? *A* I hadn't examined them. I say I may have seen them.

Q Just in passing. *A* Just in passing, that is right.

Q Did you go along the road between Torrington and Winsted to look at the facilities between those points? *A* You mean last May?

Q Yes. *A* Yes. I went both ways.

Q And had you ever made a similar inspection before? *A* Not that I remember.

[*1957*] *Q* Then as far as physical inspection goes, except for some time when you may have seen them casually, when you were not particularly interested in them, you never examined any of these facilities until May, 1941, is that correct? *A* Well, you are putting that a little too broadly. I visited a good many power plants in Connecticut at different times, and if your word "facilities" is broad enough to include all the facilities of these companies, I don't believe that is true. If you are limiting it to these particular ones we are discussing, I think it is true.

Q I was, sir. Now, have you ever been employed by The Connecticut Light and Power Company, or any other company that owned any of these specific facilities that you have mentioned in these four sections. *A* I don't know just how to answer that. In my, what we call qualifications, I stated that I had made a certain study for a group of companies in New England, and this is

confidential matter as to subject matter, but I guess there is no impropriety in saying that is one of the companies interested. I wasn't employed directly by them, but they were interested.

Q Whatever that matter may have been, it did not involve a minute examination of such facilities as those which you have referred to in your testimony here? *A* Not a visual examination, no. Not a visual examin- [*1958*] ation.

Q Leaving out generating plants possibly, it didn't involve an examination of, or obtaining knowledge of the other specific facilities which you have mentioned here? *A* Well, to avoid a possible misunderstanding, I would like to make this statement, that in matters of the sort we are dealing with, the studying of generation and transmission and consumption of energy, the operations of utilities, the only knowledge ordinarily that is important is the knowledge of specifications, diagrams, and records, reports. The visual examination of the system is of very little importance. The generators are designed in distant cities, shipped complete, the transmission lines are designed in some office somewhere. The reports of operations, or the reports of meters—there is no use in looking at the meter, you can't stay there and read it—if you have the records of it, that is the thing that counts.

Now, I assume your question leaves out of account that sort of information. As for information gotten by visiting and examining these things, I have comparatively little other than that which I have already described.

Q Any studies you made at that time didn't involve going into the question of how many customers were served on particular lines in the East Hampton section, for instance, did it? [*1959*] *A* No.

Q I mean, your study was of a broad nature, and about all you needed to know was where the generating plants were and generally the connections between them, isn't that true? *A* And the generation, disposition of energy, and things in connection with it.

Q But not the study of the specific facilities such as you mentioned here? *A* Well, not the number of customers, nor where

John Jones's circuit was connected. Such things as that I was not interested in.

Q Now, you have testified at some length, Mr. Thomas, in regard to the operation of the transformer. I think nowhere in your testimony have you mentioned a matter, and that is whether the current on both the primary and secondary side of the transformer is the same or a different current. What is the fact? *A* The primary and secondary currents—now, I am ignoring the exciting current—are of equal value, but one passes in one direction around the core and the other passes in the other direction around the core, and they obviously can't be the same actual current. I am talking of the current, not the energy.

Q And if, however, you have an auto-transformer, there is an electrical connection so that it is the same current, is [*1960*] that correct? *A* Well, the auto-transformer is different in principle than the two-winding transformer. In the auto-transformer, as I explained at some length—

Q Can't you, without going into a long explanation, can't you just answer that question? Isn't it true that in the auto-transformer the current on both sides is the same current? *A* No, I don't think so. I would be glad to explain. If you insist on a yes or no answer, I will say no.

Mr. Wahrenbrock: May the witness be allowed to explain?

Trial Examiner: If he is unable to answer, that is a matter for the witness.

By Mr. Branch: *Q* Go ahead and give us your explanation. *A* What I had in mind was this: I have explained the principle of the auto-transformer, that where it is intended to raise the voltage of one circuit, supply circuit, to a higher voltage for a receiving circuit, we make use of a transformer only to obtain the difference in voltage between the two circuits. Now, the auto-transformer, as far as it acts as a transformer, is just like another transformer, and the primary and secondary currents are separate in the same sense. But when you apply the secondary current to the supply circuit to get the added voltage, there is necessarily a connection

between [*1961*] them. But the currents are just as distant as far as the transformer goes as they ever were. There is a connection between the primary and the secondary, but the current that goes to the high voltage receiving circuit from the connected lead of the supply circuit is not the same current that goes through the primary of the transformer.

Q Coming back to what you call power transformers as distinguished from auto-transformers, the voltage is different on the two sides of the transformer, is it not? *A* It may or may not be, according to the design.

Q But ordinarily, there is a change in voltage, is there not? *A* You are talking now of commercial transformers and not the simplified transformers?

Q Yes. *A* The Commercial transformer?

Q Yes. *A* Well, often, there is a difference in voltage. I think I said the auto-transformer is particularly useful—

Q I am not talking about the auto-transformer now. I am talking about power transformers. *A* I see. Well, in a great majority of cases there is a difference in voltage between the primary and secondary in power transformers.

Q There is also a difference in the amount of current [*1962*] as well as the actual identity of the current, is there not? *A* As I explained in connection with the simplified transformer in the commercial design, some of those ideal turns of the primary are combined in single larger wire turns, and so in the transformer there is considerable difference usually in the amount of current in the wire on the primary, or the low tension, I will say, from that in the high tension. As you know, the currents have inverse ratio to the voltage, ignoring exciting current.

Q Now, I am leaving out of consideration, sir, in this question, auto-transformers, and confining my question to what you call power transformers. Every one of the power transformers which you have mentioned in this system would make a change both in the voltage and the current, would it not—would effect a change? *A* Leaving out auto-transformers?

Q Yes. *A* Which are in fact power transformers. It is true. There is a difference in the primary winding from the secondary.

Q And the change is a substantial change in each case? *A* That is right.

Q And the change is a substantial change in the amount of current in each of the transformers, is it not? *A* Each of the transformers? Each of the windings? [*1963*] Just how is your question put?

Q I am leaving out of consideration auto-transformers. *A* Yes.

Q And I am making a general question that refers to these transformers which you have mentioned at the four places, in so far as there are transformers at any of these places, and I include Torrington, as well as Winsted, Bristol, the facilities which were connected with the East Hampton section, and the entire Groton section. And the general question applying to all of those transformers is, every one of those transformers effected a very material change in the voltage, did it not? *A* Yes. That is, the high tension voltages are very different from low tension voltages.

Q And it also effected a very substantial change in the amount of current, did it not? *A* Between the primary and secondary, yes, sir.

Q Now, you have given explanation as to the operation and effect of transformers, and you answered specific questions, I think, in regard to specific transformers at different places. I am still leaving out of consideration auto-transformers and merely referring to what you have called power transformers. Aren't those general explanations as to the operation and effect of those transformers true as to all power transformers? [*1964*] *A* Well, that is certainly a broad question. I don't have in mind any particular difference between those transformers you have referred to and other transformers but it is a broad question as you put it.

Q I am not trying to ask as to the effect which one of these particular transformers had at any particular place. I am confining myself to considering the general principle upon which the

transformers worked, and what goes on within the transformer, and the effect which it has in general. *A* I so answered.

Q And your answer as to these transformers would be just the same as answers to other transformers? *A* In a broad way, that is right.

Q And there has been no change in any of those matters in respect of such transformers within your entire experience, has there? *A* That is too general question to answer, but if you will make it more specific perhaps I can answer.

Q What I am trying to get at, and I think you will readily agree with me, I am not trying to get any broader statement than you are willing to make—but what I am trying to get at is, there is nothing about any of these transformers that is unique? *A* No, I have not intended to indicate that there was.

Q And what might be said about these transformers might [*1965*] have been said about any power transformer within the scope of your experience? *A* Of course, that is ignoring all questions applied to locations and particular areas?

Q Yes. *A* In general terms, that is correct.

Q I mean, the principle and operation of transformers is no different in Connecticut than in Kalamazoo, is it? *A* Lucky for us, it isn't.

Q And there hasn't been any change in any of these principles or methods of operation within the years over which your experience goes? *A* We have learned a good deal more about them, but I don't think transformers have changed in principle.

Q Now, Mr. Thomas, I come to another matter, although it is still relating to transformers, and I am still talking about power transformers. I think in your direct testimony you stated that it was not necessary to redesign or reconstruct a transformer to obtain a different voltage ratio, but that it was merely necessary to reconnect the turns in order to determine their ratio. Will you describe the reconnections which would be necessary to change the 13.8 k.v. winding of the transformer or transformers at Bristol substation, in order to obtain a voltage of 22 k.v., from this wind-

ing for the original k.v.a. capacity. [*1966*] *A* In my prior statements to which you refer, I was talking in terms of principle. You are asking me now in terms of a concrete transformer, to explain what the actual designer would do, or are you still talking as a matter of principle?

Q Well, without going into too much detail, I want to know in general what you actually would have to do. *A* The thing that you wish to do is to raise the voltage?

Q Yes. *A* From 13—

Q From 13.8 to 22. *A* The thing the designer would do would be to reduce, to take primary turns and connect them in parallel instead of in series. That would produce a higher voltage in each turn, because the applied voltage would be divided into a fewer number of parts, since the voltage on each turn in the secondary would be increased, the voltage of the number of turns that are there connected in series would be increased. Now, that is as a matter of principle.

Q Now, will you—I don't want to cut you short, but my question applied to this specific problem on this, a specific transformer in Bristol, and will you direct your answer to that. *A* Well, I had that Bristol transformer in mind. I said the designer, or whoever knows about the transformer, [*1967*] would reconnect the primary turns in such a way that there would be fewer of them in series. The current from the applied e.m.f. wouldn't go around as many times; that is, if it is—if the primary is 66 k.v., and you halve the number of turns the current went around, every turn would have twice as much voltage on it. If the volts per turn were 3 volts as it is wound, it might have 6 volts. You have cut the number of turns connected in the series in the primary in half. That would double the voltage that you would get on the secondary. It wouldn't be quite 22, but you correct the amount of change to the amount necessary to give you the voltage you want.

Q You have stated what the designer would do. Is such a reconnection and such a change as you have mentioned one that

could be handled with the operating personnel of the company there?

Mr. Wahrenbrock: Mr. Examiner, there is no basis that shows that the witness has any knowledge of what the operating personnel of this company can do.

Trial Examiner: You may answer the question generally.

The Witness: I have already explained that situation. If it is anticipated that there is any occasion to make such changes in the voltage, either primary or secondary, at which a transformer is to be used, it is easy, if these changes aren't too complicated, to provide so that the transformer can be connected in either way, and to have the facilities [*1968*] for making the changes on the outside of the transformer, which they frequently do.

Q Will you confine yourself to the particular transformer at Bristol with which I understand you are familiar. *A* As far as I know, if anybody made the attempt, one of the Bristol operators, to make the change in that particular transformer, he probably would have plenty of trouble, and the transformer would not operate efficiently, because it is not designed to be used in such a way. The efficiency of a transformer is a very finely balanced matter.

Q As a matter of fact, such a reconnection couldn't be done by a repair shop without detailed instruction from an engineer who is competent in design? *A* It sometimes happens that the change from 2 to 1 can be made, and it might in that transformer, although I don't know, for I haven't seen the inside. But in general, it is hard to make those changes unless they are planned ahead.

Q As a matter of fact, you wouldn't think, if you were consulted about such a matter, you wouldn't think of advising such change to be made without the close cooperation of the manufacturer? *A* As a matter of fact, the question of insulation, I think, would prevent making that particular change in that particular transformer. It would make too high a voltage. The secondary is not insulated for that.

[*1969*] *Q* Is it not a fact that such a reconnection would require the careful engineering design of a new winding and a major reconstruction of the transformer? *A* Well, that is a matter of definition, as to just what a major reconstruction is, but I wouldn't think of undertaking it on those transformers, as a practical matter.

Q And what you have said, I think you have said that there are transformers which are so made, that they can be used to reduce the voltage either to 110 volts or 220 volts, is that correct? *A* That is correct.

Q That means merely that there are two different low voltages that can be obtained from that transformer, isn't that correct? *A* You mean in commercial service?

Q Yes. *A* Yes, that is the effect.

Q But there aren't any other voltages that could be obtained readily from that by a simple process? *A* I remember once as a young engineer I laid out a transformer with three different voltages in the secondary. Those are the ones you practically use, the ones you plan for.

Q That is what I meant. *A* Yes.

Q Persons do plan for two, you young engineers plan [*1970*] for three, but the point is it is used only for the particular voltages that are planned for, and for which they are designed, isn't that true? *A* As a practical matter, in ordinary commercial service, that is correct.

* * * * * * [*1971*]

Q Mr. Thomas, I have asked you some specific questions about making changes in a specific transformer in Bristol; would your answers as to what would be involved in changes such as I have indicated also apply to making similar changes in any of the transformers which you have referred to, including not only those of The Connecticut Light and Power Company, but also those of the other companies which you have mentioned in your direct testimony?

Mr. Wahrenbrock: Mr. Examiner, I think that question is so broad as to cover much more ground than most of us listening to it can apprehend.

Trial Examiner: I don't know that it has a particular demerit if it keeps within the proper bounds of cross examination. Read the question back.

(The question is read by the reporter.)

The Witness: Shall I answer?

Trial Examiner: You may answer.

A As a matter of principle, as far as I remember the statements, I think that is true. Of course there are differences in voltages, and some other differences in the immediate settings, that might possibly affect the answer in some detail.

Mr. Branch: Thank you. That covers it sufficiently, I think.

[*1972*] By Mr. Branch: *Q* Mr. Thomas, do loads in general require reactive power as well as active power, particularly if there are induction motors on the load? *A* Yes.

Q Can electric power be delivered to the common type of induction motor at unity power factor, that is, without being accompanied by reactive power or reactive volt amperes? *A* You are leaving out of account the use of static condensers and things of that kind as not part of a motor? Ordinarily, certainly you require the exciting current, which is reactive power, to make an induction motor operative. I don't know that I just know what the import of your question is, but I can answer its terms that way.

Mr. Branch: Your answer is sufficient.

By Mr. Branch: *Q* Can you say from what sources the reactive volt amperes are supplied to the loads of The Connecticut Light and Power Company, which were connected to the C.P. 1 and C.P. 2 lines during the 21 days involved in Mr. Miller's study, which is Exhibit 61 and Exhibit 62?

Mr. Wahrenbrock: I would like to have that question read back again, Mr. Examiner.

Trial Examiner: The question will be read for the benefit of Commission Counsel.

[*1973*] (The question is read by the Reporter.)

A If I had the additional data necessary, the reactive kilo-volt-amperes could be handled in the same way as the active.

By Mr. Branch: *Q* But his studies did not give any indication as to that matter, did they? *A* I believe he didn't attempt to go into that subject.

Q Now, in particular can you say from what sources the Winsted and the Bristol loads received their required reactive volt amperes which accompanied their active power supply during those 21 days? *A* Not with the data before me.

Q Could those loads at Winsted and Bristol, as they have existed since January 1, 1937, to make a time definite, have been supplied with energy at unity power factor, that is, with energy accompanied by no reactive volt ampere hours?

The Witness: May I have that question again?

Trial Examiner: The reporter will read the question to the witness.

(The question is read by the reporter.)

A If you have reference to the transmission line, and proper capacity in synchronous condensers exist, it would be possible to have the energy supplied at unity power factor over the transmission line, but broadly speaking, as I think [*1974*] your question is intended, I would say no.

By Mr. Branch: *Q* Mr. Thomas, I am going to call your specific attention now to particular places in your testimony.

On page 1595, you answer this question as follows:

> "*Q* As a matter of common and accepted engineering practice can the flow of electric energy between a source of supply and a load be detected?"

And you answered, in substance, that that was done regularly in service by suitable instruments, called electrical watt-meters.

The electrical watt-meter does not detect the source of the flow, where there are two different generators attached to a line and are acting in parallel, does it?

Mr. Wahrenbrock: Mr. Examiner, I am going to object to that question in the first place because respondent's counsel has not accurately reproduced the substance of the testimony referred to.

Mr. Branch: I think I have, but in order to obviate any doubt, I will read the whole thing word for word. I am now quoting from page 1595:

> "*Q* As a matter of common and accepted engineering practice can the flow of electric energy between a source of supply and a load be detected?
>
> "*A* Yes. That is regularly done in service.
>
> [*1975*] "*Q* How?
>
> "*A* By suitable instruments.
>
> "*Q* What is a common type of such instrument?
>
> "*A* The electrical watt-meter."

That was your testimony, was it not, Mr. Thomas?

The Witness: As I remember it, yes.

By Mr. Branch: *Q* Now, you did not mean to say, or indicate, did you, either by that testimony, or any other testimony, that a watt-meter would determine the source of supply as between the two sources of supply, if the loads were connected with two generating plants which are acting in parallel? *A* I don't think the answer purports to show that. It wasn't intended to.

Q All right. I make my question broader. It is a fact, is it not, that the electrical watt-meter would not do that? *A* I have already testified to that fact.

Q You mean you agree with my statement? *A* Yes, that a watt-meter measuring a combined flow from two sources does not indicate which part of that combined flow came from the individual sources.

Q And there is no other instrument known which does, is there? *A* Not that I know of, not in this situation which you

[*1976*] are putting up. In some detailed situation, I might answer, perhaps, a different way.

Q I am turning to page 1285, and Mr. Wahrenbrock, I am going to vary my usual practice by inviting interruptions. Rather than read all of this answer and so forth, I am going to pick out parts. After I have finished my question, if you feel that I haven't correctly represented his testimony, will you so state, and then I will read the whole business, if I feel there is any basis for it, because I am most anxious to represent the testimony fairly, in a way that will be beyond any possible criticism.

Mr. Thomas, I think you testified in substance, as follows:

That where electric currents or electric energy comes from two sources and enters a conductor and traverses the conductor to some further point, the usual working concept or hypothesis is that the two currents mix and commingle in an intimate way and that any portions of the mixed current drawn from the conductor at various later points will have about the same proportions of the two currents as was contained at the point of mixing. Is that in substance your testimony? *A* That is as I remember it.

Q There you did expressly limit it, did you not, to a usual working concept or hypothesis? A Well, I don't consider that a limitation. I made the statement that way to show you what was in my mind. I don't see [*1977*] that that is a limitation, exactly.

Q Well, a hypothesis means something that is accepted often without proof, does it not? *A* Yes, that is a fair statement.

Q And this is an instance where you must accept something that cannot be proved, in order to come to that conclusion, is it not? *A* No, I wouldn't go as far as to answer that question in the affirmative. I stated the fact that that hypothesis has been used by so many people for so long a time with successful results, to my mind, is proof that it is, within the range in which it has been used, correct and proved.

Q Well, I think you have said though that until the Federal

Power Commission had this problem before it, there was no occasion for considering that particular problem, didn't you? *A* Well, you have stated a much broader conclusion, I didn't intend to state that that general principle had been considered only in the case you speak of. That is arising in men's minds all the times.

Q Well, what particular situation has arisen outside of this that would call upon engineers to determine that question? *A* Oh, I was thinking of the hypothesis, the conception, in a man's mind. An engineer, looking at a problem where two currents come into the same conductor, and pass along, and im- [*1978*] mediately in his mind is the picture of the mixture. I don't bear in mind just at this minute any case where it was necessary to make a logical proof of the point that you have raised. I think I stated that before.

Q Now, why did you qualify your answer by saying that the portions of the mixed current drawn off from the conductor at various later points would have about the same proportions? *A* Well—in a general conversation of this kind it is so easy to state something which may be applied in other conditions that I like to be careful. If we were discussing the ultimate nature of matter and going into the mathematics of physics, we might get to some points where we are distinguishing between what is theoretically perfect and accurate, and what is substantially and practically correct, and I wanted, for fear this would lead into some theoretical situation, to guard against having said that this was of the nature of a mathematical equality or proportionality.

Q Well, how would you go about determining the difference between the proportions? *A* I have no such thing in my mind.

Q You don't know of any method of determining that, do you? *A* Well, I wouldn't answer that without giving it a little thought. You are asking rather a searching question, and I would have to have a little time.

[*1979*] *Q* You never have considered that question, have you?

A Do you mind restating the question, as long as you are pressing it? I would like to be sure that I know just what you have in your mind.

Q Well, I mean the question as to the variation between the proportions, between the two currents, that entered the conductor and the proportions of the two which supply any particular load. *A* I don't think I have ever made any effort to determine variations in the proportions in a case like that.

* * * * * *

Q You have stated, Mr. Thomas—I turn to page 1608 [*1980*] Mr. Wahrenbrock, because I am going to paraphrase and give in substance,—but you have agreed with the conclusions of Mr. Miller in the study of the power question. I quote now:

> "Relying upon a well-known axiom of the flow of current in electric circuits, namely, that the current can flow in a single circuit only in one direction at any instant of time, and that is, what might be called simultaneous counterflow cannot exist. This is equally true of energy. This fact is known by experience in electric systems."

I have finished quoting your testimony. What experience in electric systems establishes any such principle as that? *A* Well, in the first place, as I have already explained this fact, that hypothesis, that way of looking at it, whatever you call it, has been used so long by so many people, agreeing with observed result, it seems to me that established by experience.

Q Is that all you meant by "establishing by experience?" *A* Well, analysis, I think, will show that it will be contrary to experience that anything else should exist, or rather, that counterflow of two currents at the same time could exist in one circuit. For example, if we had one ampere going one way in a circuit and 2 amperes going the other way, if you can imagine such a thing, we would at least have the energy loss in re- [*1981*] sistance in one, due the current of 1 and energy lost in that same conductor

due to the flow of the other, due to the current of 2, making a total, we will say of 3, where as the actual fact occurs we have only the different flowing of one, and the energy loss of one. That would be a physical thing you can measure, and by experience you would know that the loss you measured couldn't be due to two currents flowing at the same time in the same wire. Maybe I didn't get the drift of your question.

By Mr. Branch: *Q* As a matter of fact, in engineering practice, is the matter not calculated both ways, one by just considering the flow as in a single direction and the other by considering the flow as in opposite directions and taking the difference, the algebraic difference? *A* It depends on what you want to accomplish. If you are looking at the physical action, you have got to take it as it is. If you are trying to find out whether you have got capacity enough in the circuit, or what the loadings might be on certain generators, something which is unrelated to the circuits in between, it might very often be convenient just to assume that it did flow both ways in the same wire, but always, you have got to do it with the caution that you are playing with fire—it might be all right and it might not.

Q How do you know that is a physical action?

Mr. Wahenbrock: I didn't hear the question.

[*1982*] Trial Examiner: Will you read the question back for the benefit of Commission Counsel?

(The question is read by the reporter).

A Well, in the first place I have already pointed out the fact that by following along such a hypothesis, we get successful results, but I think you can go further than that and see that it must be so.

Suppose we have a current flowing in a wire, and we assume an imaginary division line down the middle of that current in the wire, and we assume that the current in half of it is flowing the other way, we have come to an absurd position, because that current flows because there is something that makes it flow. Now, the thing that makes it flow in one half makes it

flow in one direction and the thing that makes it flow in the other half makes it flow in another direction, but we started with a whole current, and only one cause of flow, so it seems to me there isn't any way you can avoid that conclusion.

Q Is the entire flow of energy within the wire? *A* Are you talking theoretical physics now or do you mean, if I observe the wire, I wouldn't find any current on the outside of it? Are you speaking of energy?

Q Answer that as broadly as you want, sir. *A* Well, as far as the ordinary engineering problems are concerned, I look at it this way. The flow of energy is connected with the flow of current. That must occur in the [*1983*] presence of voltage, of course, before we have any energy. Now the current is pretty clearly confined to the conductor. There are conditions, of course, when there is a slight leakage from the conductor, but ordinarily it is confined to the conductor. Now, as to what you mean—where does the energy flow—a practical engineer in the kind of problem we are having here does not really concern himself about that, he has to control the current. If you want to go into the theory of it, well, that is another matter. I have heard them talk about it and I have read about it some. I don't undertake to know all about the theory of physics, electricity in physics. I am interested in what they say about it.

Q Well, is that as far as your studies have gone? *A* No, I answered carefully in terms there.

Q I call your attention to a question which I think the answer is somewhat typical of. The question was asked in these words, page 1609 and 1610:

> "*Q* Directing your attention to the instances as shown by Mr. Miller, in which electric energy requirements for the Winsted, Bristol and East Hampton districts of The Connecticut Light and Power Company were supplied in whole or in part from Massachusetts, will you please describe in a general way the system of facilities by which that was ac-

complished and state the functions performed by the several parts of that system, respectively?"

[*1984*] Your answer listed certain facilities and then, in the course of this you said,

> "The 66 k. v. lines, C. P. 1 and 2, and the 66 k. v. branch lines connecting therewith, together with the 66 k. v. step-down transformers, and all synchronous condensers to which they are connected" and so forth "are facilities for transmitting electric energy to the corresponding stations," and so forth.

Now, in some of your answers you said they were facilities for transmitting electric energy from Massachusetts or Massachusetts electric energy. Are they not facilities for transmitting or distributing, as the case may be, electric energy from Connecticut?

Mr. Wahrenbrock: Mr. Examiner, I object to that. No basis has been shown that any study has been made by this witness or of Mr. Miller's study, to which this witness referred, with reference to the use of these facilities for supplying energy from Connecticut sources.

Trial Examiner: I believe the question is in order. The objection is overruled.

The Witness: I understand the intent of your question. Of course, when I say "mixed energy" was transmitted over these circuits, that included some energy from Connecticut.

By Mr. Branch: *Q* In the course of all of those questions that were asked you to characterize and describe the Massachusetts, did [*1985*] you at any time refer to Connecticut energy, or there being facilities for Connecticut energy, except this one occasion, referring to the circuits known as 122, 123 and 124 at South Meadow; you said that since the change of March of this year those circuits may be such facilities, if at times they are transmitting mixed Massachusetts and Hartford energy, but such facilities evidently refer to facilities for transmitting Massachusetts energy, so I don't think even that did. Why did you not at any

time in your answer mention or consider that the facilities were facilities for transmitting or distributing Connecticut energy?

Mr. Wahrenbrock: Mr. Examiner, I must object to that question. It certainly does not direct the witness's attention with sufficient definiteness to the various facilities involved and the various statements made with respect to those facilities, so that any answer that can be given can be assumed safely to be based on a real understanding of the facilities referred to. The question is so broad as to be highly ambiguous, regardless of an assumption which might be made at the moment, that we understand it.

Trial Examiner: I think perhaps the witness had better state what facilities he refers to, in his answer, if he has any question in his mind as to what is conveyed by the question.

The Witness: Well, it seems to me that every time I have said facilities were facilities for transmitting mixed energy, [*1986*] it goes by inference that they transmitted Connecticut energy. I don't believe I understand what you are trying to get at.

[*1987*] By Mr. Branch: *Q* Did you in a single place say they were facilities for transmitting mixed energy? *A* I don't remember the language. I assume that is—

Q Why did you not mention Connecticut energy in your answer? *A* I don't know that I was asked. I wouldn't have hesitated to say they were capable and were transmitting Connecticut energy if I had been asked that.

Q In various places you said that facilities were facilities for transmitting Massachusetts energy. What did you mean by saying they were facilities for transmitting Massachusetts energy?

Mr. Wahrenbrock: Mr. Examiner, let us have the question unambiguously enough to identify the places.

Mr. Branch: Oh, there are a dozen places where he said that.

Trial Examiner: I would suggest, Mr. Branch, that you might refer to some particular place, then if you want to ask the second question as to generalities—

Mr. Branch: Very well. I will find a particular place. It will take me a few minutes. No, here is a question, on page 1289:

> "*Q* Directing your attention to the instances shown [*1988*] by Mr. Miller, in which electric energy requirements for the Winsted, Bristol and East Hampton districts of The Connecticut Light and Power Company were supplied in whole or in part from Massachusetts, will you please describe in a general way the system of facilities by which that was accomplished, and state the functions performed by the several parts of that system respectively."

You then gave a long answer, and in the course of it, you said this, at the bottom of 1611:

> "Your 13.8 substation buses and equipment at the Middletown sub-station, and the 13.8 k. v. line, crossing under the Connecticut River by submarine cable, and leading to poles 110 in Portland, and before its removal in 1939, the extension of that 13.8 k. v. line to East Hampton, Colchester, and Leesville, and their step-down transformers are facilities for transmission of Massachusetts energy to East Hampton, Colchester, and Leesville."

What did you mean by saying "facilities for transmission of Massachusetts energy" to those points?

Mr. Wahenbrock: Mr. Examiner, I object to that question. It is apparent from the way in which it is phrased that the answer which the witness gave on direct examination was directly responsive to the question which had been put.

Mr. Branch: And I put the question which was put and asked what he meant.

Trial Examiner: The witness may answer the question.

[*1989*] The Witness: I meant what I said there. If it will make it any clearer, I will say I had no idea of excluding the function of transmitting Connecticut energy from the functions of those facilities.

By Mr. Branch: *Q* Why did you never in the course of your testimony in those questions mention the function in regard to Connecticut energy? *A* Well, where—

Mr. Wahrenbrock: I am going to object, because it appeared in the question to which he referred that the answer made was directly responsive, and it is, I suggest, improper to ask the witness why he didn't go further and make an answer which would not have been responsive to the question which was put. I am going to object to the question.

Trial Examiner: The original question, Mr. Wahrenbrock, included the transmission of Connecticut energy?

Mr. Wahrenbrock: No, sir.

Mr. Branch: He is referring generally to these studies, sir, to instances as shown by Mr. Miller, and so forth, in which The Connecticut Light and Power Company were supplied in whole or in part from Massachusetts, and the studies, of course, do indicate that there were several diagrams illustrating a good many hours in which Mr. Miller was substantiated, to the extent he was, by this witness, who stated the energy [*1990*] was supplied in part from Massachusetts.

Trial Examiner: Isn't it true, the question being "During the time when it was supplied in whole or in part", if it was supplied in whole by Massachusetts energy, the suggested addition would not have been responsive to the question.

Mr. Branch: I think it would have, but I am trying to find out. It seems to me that is for the witness to explain. I say he was shown all these charts, some of which had red lines and some of which had blue lines.

Mr. Wahrenbrock: Mr. Examiner, the question did not ask for him to describe facilities by which any of these loads might have been supplied by Connecticut energy. It asked only how to describe the facilities by which these loads were supplied from Massachusetts. That is what the witness did. The reply he gave was responsive.

Now, I wish to make the further objection to the pending question that it is not limited to the specific instance to which Mr. Branch has referred here, that is, page 1291 of the transcript, but as phrased by Mr. Branch it has a catch all which is very indefinite and ambiguous.

Mr. Branch: Rather than take any more time on that, I am not anxious to do anything that could possibly be considered as ambiguous, but if it is, I suggest it is the witness and not Mr. Wahrenbrock who should suggest it.

[*1991*] By Mr. Branch: *Q* To the extent that facilitie in your opinion did have Connecticut energy on them, were they facilities for the transmission or distribution of Connecticut energy? *A* Facilities capable of such transmission, yes.

Q Why do you say "capable"? *A* I only qualify that so that it shan't mean exclusively for the transmission of Connecticut energy.

Q You didn't qualify your answer when you were stating that they were facilities for transmitting Massachusetts energy, did you, Mr. Thomas? *A* The questions as I remember in my testimony on that subject all relates to the studies made by Mr. Miller, and those studies were made specifically to examine the flow of Massachusetts energy without Connecticut, and in answering them I assumed that that was the information that was desired.

Q In other words, you were just trying to give this a Massachusetts color rather than a Connecticut color, was that it? *A* I think that is your suggestion, and not what was in my mind.

Q You didn't mention Connecticut at any point in your testimony, did you? *A* Well, that is a broad question. I didn't feature the transmission of Connecticut energy because it seemed to [*1992*] me that that was outside of the purpose of the questions.

Q All right. Now, what did you mean by saying that these were facilities for transmitting Massachusetts energy, any more than they were facilities which in your opinion could be used for transmitting Massachusetts energy? *A* Well, just the difference between the possibility and the actual fact. That is all.

Q You didn't mean, did you, that they were specifically designed for Massachusetts energy? *A* No, I didn't mean that.

Q And you didn't mean, did you, that the design or operation of any of the facilities belonging to The Connecticut Light and Power Company would have been in any respect different if there had been no connection with Massachusetts? *A* Well, I think it is too far to say there wouldn't have been any change in detail. You understand that distance and all those things come into design. But maybe as you understand the question I could answer in the affirmative.

Q But you can't point to any specific thing which you have characterized as a facility for transmission of Massachusetts energy or a facility for transmission—for distribution of Massachusetts energy belonging to The Connecticut Light and Power Company which would have been different if there had been no connection with Massachusetts, can you? *A* Well, the Agawam lines are part of these facilities.

[*1993*] *Q* I say belonging to The Connecticut Light and Power Company. *A* Oh, The Connecticut Light and Power Company. I beg your pardon. I think I had better hear that question again, if I may.

Trial Examiner: The reporter will read the question for the benefit of the witness.

(Whereupon the last question as above recorded, was read by the reporter.)

The Witness: Well, I didn't design those lines or know just what basis—I don't think of any specific thing that would have been different, but I wouldn't want to say that if Massachusetts energy had never been considered there wouldn't have been some change. I don't have anything in mind, but it is conceivable that it might have been done.

Q But you made a careful study of these facilities of The Connecticut Light and Power Company which you have characterized as facilities for transmission at least? *A* I have examined the

physical facilities, yes. Not as to their history, nor why they were laid out as they were, or anything of that kind.

Q I understand. You don't mean to express any opinion as to the function for which any of these facilities was actually designed? *A* No, I didn't say that. I meant to say I don't know [*1994*] the numerical importance placed on this or that, or just how they arrived at the voltage, or just how they arrived at the size of the conductor. I know what they have arrived at, and how they use it, but I don't know whether they took into consideration taking power from north of the State. I just don't know.

Q Now, in your testimony, you were several times asked questions of which the following is an example. I refer to one on page 1628. First let me see if it was answered. Yes, it was apparently answered on page 1631, in the affirmative.

> "In so far as the energy so transmitted has been shown by Mr. Miller to be transmitted from Massachusetts and consumed at points in Connecticut, in your opinion are those facilities facilities for the transmission of electric energy which is transmitted from Massachusetts and consumed in Connecticut by persons other than transmitters thereof?"

You answered that question and some similar question in the affirmative, or you used the term "persons other than the transmitter thereof". In what sense did you mean "a person other than the transmitter thereof"? *A* I merely had in mind the fact that these are electric utilities, and they distribute energy to the public, and many, many customers. That is the ultimate destination of the energy.

[*1995*] *Q* Well, whom would you consider the transmitter in the case of, we will say, energy which you say went—came from Massachusetts, and which you have stated, according to your Miller, went to Bristol at certain times? *A* Any person—if you say person, owner who had a hand in the transmitting of the energy.

* * * * * * [*1996*]

Q I think this is clear, is it not, that there is no electrical connection between the two coils in the transformer? *A* Except in the case of the auto-transformer, in which case it may be outside.

Q You do not understand, do you, that The Connecticut Light and Power Company ever owned or operated the cable from [*1997*] the little substation on the shore at Groton Long Point and Fishers Island? *A* No, I never had any idea that they did.

* * * * * * [*1998*]

Q You came up here on a field trip in 1941, in May, didn't you? *A* Yes.

Q And you examined not only the facilities of The Connecticut Light and Power Company, which you have mentioned, but various facilities at other times, did you not? *A* Yes.

Q And your travels took you from the New York State line to the Rhode Island State line, did they not? *A* I believe so.

Q And did you discover any facility which had to do with transmission or distribution of electric energy owned by The Connecticut Light and Power Company outside the State of Connecticut? *A* I believe not, although I am not perfectly clear about the stub ends of some low voltage lines. I am not perfectly clear whether I was told that some company had supplied a retail customer across the border or something of that kind; I just don't remember it.

Q Nothing that you regarded as a facility for the trans- [*1999*] mission of electric energy? *A* No.

Q And how long have you been familiar with the connections of The Connecticut Light and Power Company? *A* Well, that is such a general question. Of course, I have known of the company for a good many years and some of their connections. I never knew them all. I don't see how I can make any better answer.

Q When did you make this study that you said included some kind of consideration of the facilities of The Connecticut Light and Power Company? *A* I think that was in 1924.

Q I am confining myself now to August 26th, 1935 and periods subsequent to that. As far as you know did The Connecticut Light and Power Company ever have any facilities which you would characterize as a facility for the transmission of electric energy which crossed the State line and was actually owned by the Connecticut Light and Power Company at a point beyond The State line or at the State line?

Mr. Wahrenbrock: Mr. Examiner, I object to that same question previously objected to and I object to it for the same reasons I previously did.

Trial Examiner: The objection is overruled. The witness may answer.

A As I already answered, I know of no such facilities cross- [*2000*] ing the State line.

Q Or connecting at the State line with a facility in any other company? *A* That is also true.

* * * * * * [*2004*]

Redirect Examination by Mr. WAHRENBROCK.

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Do you mean to indicate by your testimony that the source of energy cannot be ascertained where, as at South Meadow, there are several meters on several circuits, and you can obtain readings for the same periods of times on those several circuits from those several meters? *A* I have several times stated that from the reading of a meter, it is not possible to locate the source of the current, but the reading of the meter, taken in conjunction with the existing circuits, and with the readings of other meters, usually [*2005*] does make it possible to trace the sources and flows of current. Meter reading requires further support from the knowledge of the circuits in which the meter and the current are associated, to determine sources and dispositions of energy.

Q And is what you have said true of electric energy as well as current? *A* Yes.

Q In his cross examination, Mr. Branch asked you, and you replied, with respect to reactive energy. I wish to ask whether the reactive energy to which you referred, constitutes any part of the electric energy purchased, received and paid for by The Connecticut Light and Power Company at any one of the several delivery points referred to in your testimony on direct; that is, Bristol substation, Pole 110 and Torrington? *A* No.

Q In your cross examination, in referring to connections, or the absence of connections between coils in transformers—I believe in two-winding transformers—I think you said something about an electrical connection. By "electrical connection" did you mean a metallic connection? *A* Yes, such a connection as would permit the flow of current from one conductor to another, in the usual manner.

[*2006*] *Q* The flow of current from one conductor to another. *A* Right.